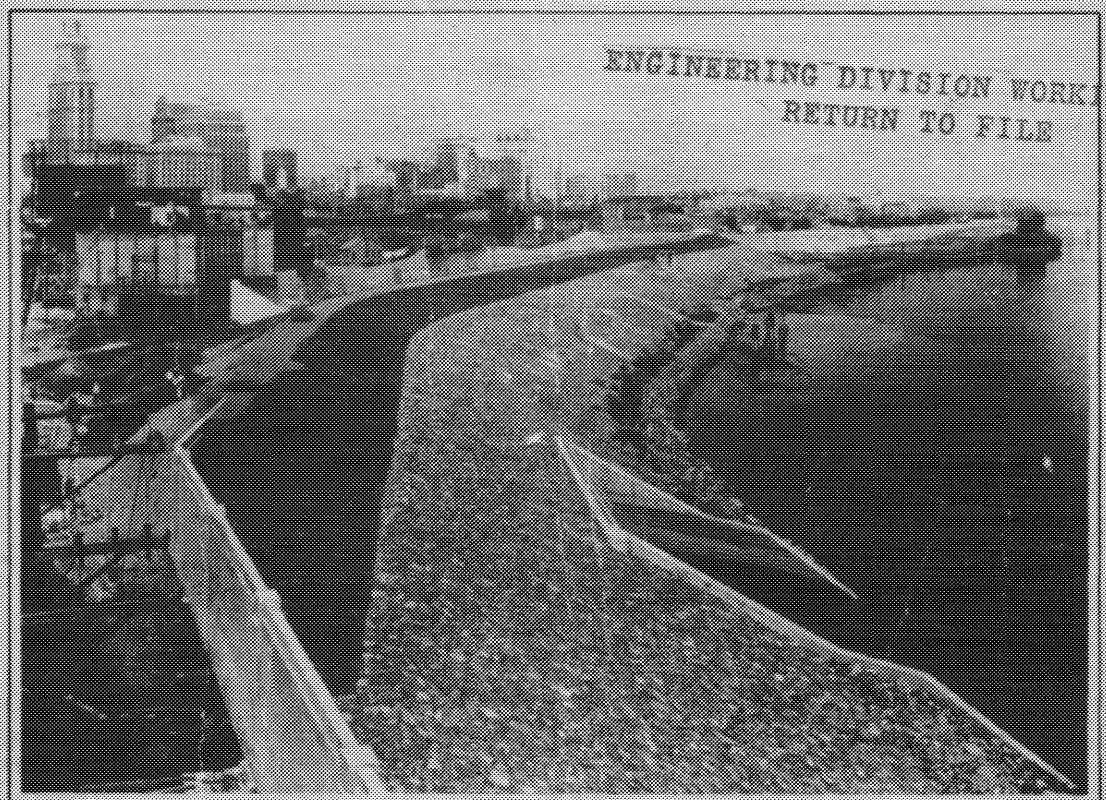
CONNECTICUT RIVER FLOOD CONTROL

OPERATION AND MAINTENANCE MANUAL

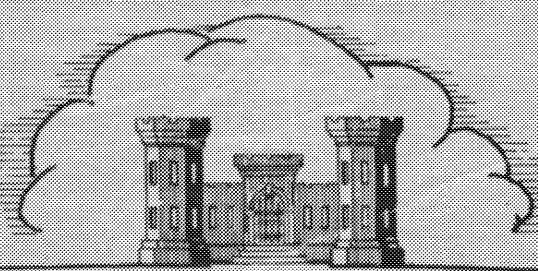
FOR

FLOOD PROTECTION SYSTEM

HARTFORD, CONN.



PARK RIVER DISCHARGE



WAR DEPARTMENT CORPS OF ENGINEERS U. S. ARMY

U. S. ENGINEER OFFICE PROVIDENCE, R. I.

JANUARY 1946

OPERATION AND MAINTENANCE MANUAL

FLOOD PROTECTION SYSTEM

HARTFORD, CONNECTICUT

FOREWORD

The successful functioning of a flood protection system is not assured by construction of an adequate system of dikes, walls and pumping plants. If the system is to perform its function it must be carefully maintained during periods of normal river stages and properly operated during flood periods.

The need for proper maintenance cannot be too highly stressed in view of the fact that large damages may be incurred through failure of a critical element in flood time, caused by deterioration or damage that would have been eliminated by proper maintenance.

Necessary maintenance and proper operation require that responsible local persons have a thorough understanding of the functions of the various units of the system and the best methods of maintaining the system and operating it during flood emergencies. It is the purpose of this manual to provide complete information so that all parties may know their responsibilities in maintaining and operating the flood protection system in accordance with the regulations prescribed by the Secretary of War so as to obtain maximum benefits. Maintenance and operation shall be provided in strict accordance with the regulations prescribed by the Secretary of War as amplified by this manual.

OPERATION AND MAINTENANCE MANUAL

LOCAL FLOOD PROTECTION WORKS

HARTFORD, CONNECTICUT

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OPERATION AND MAINTENANCE MANUAL
LOCAL FLOOD PROTECTION WORKS
HARTFORD, CONNECTICUT

SECTION I. INTRODUCTION

1-01. Authorization. - The flood protection project for Hartford, Connecticut was authorized by the provisions of the Emergency Relief Appropriation Acts of June 22, 1936, June 29, 1937 and June 21, 1938, the Flood Control Act approved June 28, 1938 (House Document No. 455, 75th Congress, Second Session) and modified by the Flood Control Act of August 18, 1941 (House Document No. 653, 76th Congress, Third Session). The Act of October 26, 1942 (Public No. 759, 77th Congress, Second Session) further modified the existing project to include construction of Gully Brook Conduit.

1-02. Location. - The project is located in the City of Hartford, Connecticut on the west bank of the Connecticut River fifty-two miles above its mouth.

1-03. Date of Construction. - Construction started March 24, 1938 on the first unit and was substantially completed on 24 August 1944. The designed protection will not be obtained until two temporary pumping stations are replaced with permanent structures.

1-04. Description. - The protection consists of 34,000 feet of earth dike and 4,400 feet of concrete flood wall along the west bank of the Connecticut River, 5600 feet of pressure conduit for the Park River, 3100 feet of pressure conduit for Gully Brook, and four pumping stations to handle drainage and sewage in time of floods or high water.

The dike system starts at the northern limits of the City of Hartford on high ground on Windsor Avenue and extends in an easterly direction to the Connecticut River, thence in a southerly direction along the Connecticut River approximately six miles, thence westerly to high ground on Wethersfield Avenue at the southern limits of the City of Hartford.

The dike system is continuous from beginning to end except for a short section at the Memorial Highway Bridge where high ground is encountered. The construction was divided into three sections and for convenience of description the same procedure will be used. The sections are: North Meadows Dike from the upper limits to Memorial Bridge, Riverfront Dike from Memorial Bridge to a point approximately 1,000 feet below the Hartford Electric Light Company, and South Meadows Dike (Clark Dike) from a point below Light Plant to end at Wethersfield Avenue.

The North Meadows Dike is constructed entirely of earth, being 16,400 feet in length with an average height of 27 feet. There are two concrete railroad stop log structures, one at the upper end for a double track main line, and one near the southern end for a single track branch line. Four ramps are provided across the dike to permit easy access to the riverside of the dike. One pumping station with storage pond is provided to handle surface water drainage in time of high water.

The Riverfront Dike is constructed of earth dike and concrete floodwall, the concrete floodwall being used due to restricted space for construction. There are 5,300 feet of earth dike and 4,400 feet of concrete floodwall. One ramp is provided in the earth dike section opposite Wawarme Avenue for access to the riverside of the dike. Two concrete stop log structures are provided at the Hartford Electric Company, one for a single track siding and one as an access door through the floodwall.

The construction of the Riverfront Dike blocked the Park River which flows through the City of Hartford and emptied into the Connecticut River approximately 4,300 feet below Memorial Bridge. The Park River was inclosed in a twin barrel pressure conduit, from a point where any backwater would be retained within the banks, through the Riverfront Dike and emptying into the Connecticut River 3,500 feet below Memorial Bridge. The conduit is 5,600 feet in length and was constructed in the old streambed through the Town and across a park area when the river made a long sweeping bend.

The construction of the Park River Conduit blocked a brook known as Gully Brook, which emptied into the Park River near the point where the New York, New Haven & Hartford Railroad crosses Asylum Street. Gully Brook starts in Keeney Park and through the downtown district was inclosed in a conduit. The portion of conduit that would be unable to withstand the increased pressure was rebuilt and additional conduit was constructed across Bushnell Park to empty the brook into the Park River conduit. The new construction and portion rebuilt totaled 3,100 feet of single barrel pressure conduit.

The construction of the Riverfront Dike and conduit system requires two pumping stations to handle surface water and sewage in time of high water. The Bushnell Park Pumping Station was built to discharge directly into the Park River Conduit and the Keeney Lane Pumping Station discharges into the Connecticut River through a conduit under the Riverfront Dike.

The South Meadows Dike is constructed entirely of earth, being 11,400 feet in length with an average height of 24 feet. Two stop log structures are provided at the lower end, one for access to an oil bulk station and one for a branch line track and siding of the New York, New Haven & Hartford Railroad. One pumping station is

located at the lower end to handle surface water. One ramp is provided for access to riverside of dike.

1-05. Protection Provided. - The dike system affords protection to all areas subject to floods in the City of Hartford. The project grade for dikes and walls was designed to protect against a flood greater than any of record, as modified by an approved plan of twenty reservoirs. The grades at all points are above the maximum stage of the record flood, that of March 1936. At the request and expense of the City of Hartford, the walls and dike grades were increased 5 to 6 feet, the crown width for dikes was increased from 10 to 15 feet, and a conduit provided for the Park River in lieu of the open channel improvement of concrete walls proposed in the approved plan.

1-06. Location Map. - See Plate No. V of Appendix "D" for location map.

SECTION II. LOCAL COOPERATION REQUIREMENTS

2-01. Flood Control Acts. - The Flood Control Act approved June 22, 1936 (Public No. 738, 74th Congress) provides, "That hereafter no money appropriated under authority of this Act shall be expended on the construction of any project until States, political subdivisions thereof, or other responsible local agencies have given assurances satisfactory to the Secretary of War that they will:

> "(a) Provide without cost to the United States all lands, easements, and rights-of-way necessary for the construction of the project.
>
> "(b) Hold and save the United States free from damages due to the construction works, and,
>
> "(c) Maintain and operate all the works after completion in accordance with regulations prescribed by the Secretary of War."

The Act approved June 28, 1938 and modified August 18, 1941 and October 26, 1942, which provided money and authorization for the flood protection works in Hartford, Connecticut stated that the above provisions (a), (b), and (c) would still apply.

2-02. Assurances. - The Flood Investigation and Improvement Committee created by resolution of the Court of Common Council, adopted April 13, 1936, functioned until May 28, 1937, when the Flood Commission of the City of Hartford was approved, (Senate Bill No. 862 - an Act establishing a Flood Commission in the City of Hartford), as the agent responsible and empowered to furnish assurances to the Secretary of War as required by the Flood Control Act of 1936.

The work of enlarging and raising the Clark Dike was performed under provision of the Emergency Relief Acts of June 22, 1936, June 29, 1937 and June 21, 1938. Assurances were furnished September 22, 1936 and were not immediately approved by the Chief of Engineers due to a revision that was deemed necessary; however, the Chief of Engineers authorized the District Engineer to proceed with the work upon receipt of right of entry to land owned by the City and to revise the assurances before entering on property not owned by the City. Assurances were furnished February 19, 1938 for additional work in the same area and were approved March 26, 1938.

The existing project was authorized by the Flood Control Act approved June 28, 1938 with modifications of August 18, 1941 and October 26, 1942. Assurances were furnished the Secretary of War as shown below:

PROJECT	ASSURANCE DATED	APPROVED BY SECRETARY OF WAR
North Meadows	November 18, 1938	December 6, 1938
Riverfront	May 31, 1940	July 9, 1940
Park River	July 9, 1940	August 26, 1940
Gully Brook	June 29, 1943	July 27, 1943

A copy of these assurances is given in Appendix B of this manual.

SECTION III. GENERAL REGULATIONS

3-01. Purpose of This Manual. - The purpose of this manual is to present detailed information to be used as a guide in complying with "Flood Control Regulations - Maintenance and Operation of Flood Control Works" as approved by the Acting Secretary of War on 9 August 1944, and published in the Federal Register on 17 August 1944, a copy of which is bound in the back of this volume as Appendix A. In executing assurances of local cooperation for the Hartford project, the City has agreed to maintain and operate the completed works in accordance with those Regulations. The Regulations are intended to cover all local protection projects constructed by the Department throughout the United States, are general in nature, and obviously cannot give detailed instructions for the maintenance and operation of a specific project. The details set forth in this manual for maintenance and operation of the East Hartford project are intended to supplement the Regulations to permit obtaining all the benefits and protection against floods for which the project was designed. Failure to maintain and operate the project as required by the Regulations and as detailed herein can cause severe property losses and loss of life and can result in an irreparable loss of confidence in the flood protection system by citizens who have invested their funds on the basis of the protection which it provides.

3-02. General Rules and Regulations. - The general rules of the Regulations prescribed by the Secretary of War to govern the maintenance and operation of flood control works are given in quotation marks in the following paragraphs and are defined further by remarks under each quotation.

(1) "The structures and facilities constructed by the United States for local flood protection shall be continuously maintained in such periods as may be necessary to obtain the maximum benefits."

(a) These requirements cannot be overstressed and the City authorities must make adequate provisions for funds, personnel, equipment, and materials to allow for the proper maintenance and operation of the flood protection works.

(2) "The State, political subdivision thereof, or other responsible local agency, which furnished assurance that it will maintain and operate flood control works in accordance with regulations prescribed by the Secretary of War, as required by law, shall appoint a permanent committee consisting of or headed by an official hereinafter called the "Superintendent" who shall be responsible for the development and maintenance of, and directly in charge of, an organization responsible for the efficient operation and maintenance of all structures and facilities during flood periods and for continuous inspection and maintenance of the project works during periods of low water, all without cost to the United States".

(a) The committee should be composed of competent members, preferably men experienced in engineering or construction work of a nature similar to the flood protection works. The committee must be given broad authority to carry out its responsibilities.

(3) "A reserve supply of materials needed during a flood emergency shall be kept on hand at all times."

(a) Materials such as sand bags, canvas or sisalcraft paper, cinders, etc., and tools such as picks, shovels, block and tackle, crow bars, etc. should be obtained and held in reserve to meet any ordinary emergency that may occur during flood periods. Borrow pits for embankment materials should be available and sources of where to obtain additional supplies of material, tools and equipment should be well established in order that these articles can be obtained quickly in case of an emergency.

(4) "No encroachment or trespass which will adversely affect the efficient operation or maintenance of the project works shall be permitted upon the rights-of-way for the protective facilities."

(a) The grazing of cattle, disposal of rubbish, erection of fences or barriers, wearing of foot paths or any form of trespassing on the project must be prohibited.

(5) "No improvement shall be passed over, under, or through the walls, levees, improved channels or flood ways, nor shall any excavation or construction be permitted within the limits of the project right-of-way, nor shall any change be made in any feature of the works without prior determination by the District Engineer of the War Department or his authorized representative that such improvement, excavation, or alteration will not adversely affect the functioning of the protective facilities. Such improvements or alterations as may be found to be desirable and permissable under the determination shall be constructed in accordance with standard engineering practice. Advice regarding the effect of proposed improvement or alterations on the functioning of the project and information concerning methods of construction acceptable under standard engineering practice shall be obtained from the District Engineer or, if otherwise obtained, shall be submitted for his approval. Drawings or prints showing such improvements or alterations as finally constructed shall be furnished the District Engineer after completion of the work".

(a) Any contemplated improvements or alterations as outlined above must be submitted to the U. S. Engineer Office, Providence, Rhode Island and the approval of the District Engineer obtained prior to the town authorizing the work. All request for approval shall be in writing and complete drawings in duplicate, one set of which shall be in reproducible form, must be submitted along with a full description of the work intended. The City will be held responsible for obtaining prior

approval from the U. S. Engineer Office, of any improvement or alterations proposed by themselves, private parties or any public utilities. The City shall furnish the District Engineer as-built drawings in duplicate of the completed work.

(6) "It shall be the duty of the superintendent to submit a semi-annual report to the District Engineer covering inspection, maintenance, and operation of the protective works."

(a) See paragraph 3-05 of this manual for instructions on submitting reports.

(7) "The District Engineer or his authorized representatives shall have access at all times to all portions of the protective works."

(a) The District Engineer or his representatives will make periodic inspections of the protective works to determine if the project is being properly maintained and operated by the city.

(8) "Maintenance measures or repairs which the District Engineer deems necessary shall be promptly taken or made."

(a) The City should maintain the facilities and keep them in good repair and not wait for the District Engineer to call matters to their attention. The District Office will advise the town how to make any major repairs to the facilities.

(9) "Appropriate measures shall be taken by local authorities to insure that the activities of all local organizations operating public or private facilities connected with the protective works are coordinated with those of the superintendent's organization during flood periods."

(a) The City should formulate plans and negotiate agreements with local organizations and companies, who are operating facilities connected with the protection works, to insure that their activities will be properly coordinated with the superintendent's organization during flood periods.

(10) "The War Department will furnish local interests with an Operation and Maintenance Manual for each completed projected, or separate useful part thereof, to assist them in carrying out their obligations under these regulations."

(a) The flood control committee should familiarize themselves with the contents of the manual. The superintendent should conduct classes to instruct his subordinates in the proper maintenance and operation of the flood protection facilities as outlined in the manual. The City authorities are encouraged to call on the U. S. District Engineer Office for any additional advice or instructions required by them in carrying out the town's obligations for maintaining and operating the flood protection facilities.

3-03. Maintenance. - a. The word "maintenance" as used in this manual, applies to the upkeep, repair and care of the work constructed

by the War Department and turned over to the City. Failure to properly maintain the structure will lead to deterioration and possible failure in flood time when there is due need of dependable protection.

b. Satisfactory and dependable operation depends on constant maintenance. The organization which cares for maintenance will be familiar with all parts of the system and will be in a position to use them effectively in time of stress.

c. Maintenance involves regular inspection of the entire system to detect any deterioration or faulty operation that needs repair. This does not mean a casual automobile trip to places easily accessible, but actually walking over every part of the system.

d. In addition to inspection, stop-log structures, and pumping stations require testing at stated intervals to discover the difficulties that may develop or the part that won't work when it should.

e. Each of the major features of your project will be discussed separately with respect to the points that should be watched as developed through the use of similar structures over a long period of years.

3-04. Operation. - a. Operation in this manual refers to the actual use of the various features of the protection works when the city is threatened by possible high waters.

b. When danger from high waters is expected it is important that decisions be reached and prompt action taken and that the person in charge has the authority to carry out his decisions.

c. To insure correct operation it is essential that at least one person is familiar with all phases of the flood protection works, who knows when to start pumping stations, install stop-logs, location of gates and valves and when to close them, just what supplies are on hand and necessary transportation of supplies to danger points, and what men and tools can be mobilized for the patrolling and repair work.

d. Arrangements should be made with the United States Weather Bureau Office, Brainard Field, Hartford, Connecticut, (telephone number Hartford 2-8116), to keep the City informed on flood predictions. The Weather Bureau Office at Hartford is the official agency for collecting precipitation and runoff data and the preparation of flood forecasts and is responsible for issuance of flood warnings. It receives during impending flood periods, telephoned reports of precipitation and runoff every six hours from selected points in the Connecticut River Basin. From these data Connecticut River stage forecasts for critical locations between White River Junction, Vermont and Hartford, Connecticut are prepared.

e. It will be to the City's advantage to negotiate agreements with private owners and companies to operate and maintain project

features that are directly related to facilities and property of those parties. The City must remember, however, that the U. S. Engineer Department will look only to the City for maintenance and operation of the project since that is the body which executed assurances of local cooperation.

3-05. Reports. - a. The regulations prescribed by the Secretary of War call for reports to be submitted by the superintendent to the District Engineer, covering inspection, maintenance and operation. Inspection of the flood protective facilities shall be made immediately prior to flood seasons, immediately following floods, and otherwise at intervals not exceeding 90 days as required by the regulations.

(1) Floods can occur in any month of the year. Spring is the season in which the majority of the floods have occurred. The three greatest floods of record occurred as follows: The highest occurred March 1936, the second highest September 1938, and the third highest November 1927.

b. To assist the superintendent in making his inspections, a series of report forms for the individual features has been prepared. Samples of these forms are given in Appendix "C". The superintendent will have additional copies printed for use in submitting his reports.

c. The semi-annual reports should be submitted in triplicate to the District Engineer each February and August. The reports will be submitted in letter form with copies of the inspection forms covering the inspections made during the period of the report. The report shall cover the following points:

(1) A description of the maintenance work performed in the preceding six months.

(2) The number and classification of men working on maintenance, regularly and intermittently.

(3) Description of any work performed by contract on the repair or improvement of the project.

(4) Describe what use or operation of the system was made during the period being reported.

(5) Suggestions relative to public cooperation, and comments concerning public sentiment on the protection obtained, are considered pertinent and desirable data for inclusion in the report, but such data are not required.

SECTION IV. DIKES

4-01. Description. - The dikes for the protection of the City of Hartford are designed on sound engineering principles and are not mere piles of dirt from the handiest sources. They are constructed of free draining river sand with a thick layer of dense impervious earth on the riverside extending down to a steel sheet pile cutoff to prevent water seeping through the dike, and at the landside toe of the dike a drain is provided to control any seepage that may occur. Both sides of the dike are covered with topsoil to prevent erosion and on the riverside where scour from the Connecticut River may occur riprap is provided.

4-02. Maintenance. - a. The regulations prescribed by the Secretary of War under Paragraph 208.10 (b) (1) give rules for the maintenance of levees. These rules apply just as well to earth dikes and are quoted here to avoid cross references to the regulations. Following this, a few of the points that apply particularly to the City of Hartford will be discussed.

> "Levees. - (1) Maintenance. - The Superintendent shall provide at all times such maintenance as may be required to insure serviceability of the structures in time of flood. Measures shall be taken to promote the growth of sod, exterminate burrowing animals, and to provide for routine mowing of the grass and weeds, removal of wild growth and drift deposits, and repair of damage caused by erosion or other forces. Where practicable, measures shall be taken to retard bank erosion by planting of willows or other suitable growth on areas riverward of the levees. Periodic inspections shall be made by the Superintendent to insure that the above maintenance measures are being effectively carried out and further, to be certain that:
>
> (i) No unusual settlement, sloughing or material loss of grade of levee cross section has taken place;
>
> (ii) No caving has occurred on either the landside or the riverside of the levee which might affect the stability of the levee section;
>
> (iii) No seepage, saturated areas, or sand boils are occurring;
>
> (iv) Toe drainage systems and pressure relief wells are in good working condition, and that such facilities are not becoming clogged;

(v) Drains through the levees and gates on said drains are in good working condition;

(vi) No revetment work or riprap has been displaced, washed out, or removed;

(vii) No action is being taken, such as burning grass and weeds during inappropriate seasons, which will retard or destroy the growth of sod;

(viii) Access roads to and on the levee are being properly maintained;

(ix) Cattle guards and gates are in good condition;

(x) Crown of levee is shaped so as to drain readily, and roadway thereon, if any, is well shaped and maintained;

(xi) There is no unauthorized grazing or vehicular traffic on the levees;

(xii) Encroachments are not being made on the levee right-of-way which might endanger the structure or hinder its proper and efficient functioning during times of emergency.

Such inspections shall be made immediately prior to the beginning of the flood season; immediately following each major high water period, and otherwise at intervals not exceeding 90 days; and such intermediate times as may be necessary to insure the best possible care of the levee. Immediate steps will be taken to correct dangerous conditions disclosed by such inspections. Regular maintenance repair measures shall be accomplished during the appropriate season as scheduled by the Superintendent."

b. Any unusual settlement, sloughing or caving should be corrected to restore the original dike grades. No major repair work shall be made without prior approval of the District Engineer in order that such repairs that may be necessary will not adversely affect the functioning of the protective facilities.

c. Toe drains at the landside toe of the dikes are provided wherever necessary to provide an outlet for seepage through the dike during high water to prevent saturation of the landside slope and the resultant sloughing. The drains consist of vitrified clay pipe laid with open joints and every fourth pipe perforated, laid in trenches that are backfilled with gravel.

(1) In the North Meadows Dike the toe drain is continuous from beginning to end with laterals leading from the toe drain to an open ditch draining to the storage pond and Meadow Brook. It is important that the open ditches be kept open by the maintenance crew to prevent plugging of the laterals and possible plugging of the toe drain.

(2) (a) In the Riverfront Dike from Station 22+00± to 32+81± no toe drain has been provided as future construction of the riverfront highway would destroy any drain that could be installed. A drain will be provided by the City or State as part of the highway construction.

(b) A short section is provided in the earth dike over the Park River Conduit from Stations 32+81 to 35+53 draining to a manhole at Station 34+70. An 8-inch V.C. and C.I. pipe leads under the railroad tracks to a manhole in the surface drain on the south side of the Park River Conduit which drains to the Connecticut River Interceptor.

(c) An under drain is provided from Station 46+00 to Station 67+25 draining from both ends to the Masseek Street Sewer and is provided with flap valves. The drains lower the ground water and possible seepage water behind the impervious blanket. It is possible for water to be present behind the blanket and if the Connecticut River should recede at a rapid rate without an outlet for the trapped water it would cause damage to the impervious blanket. It is important that the flap valves be maintained in a satisfactory operating condition to also prevent sewage entering the drain and plugging it.

(d) The toe drain starting at Station 72+50 is continuous through the remainder of Riverfront Dike connecting into the toe drain in Clark Dike starting at Station 97+05. Manholes are provided in the toe drain and the maintenance crew should remove any silt that may be present to insure proper functioning of the drain.

(3) The toe drain in Clark Dike from its beginning to Station 70+00 is in the landside toe and is provided with manholes for inspection and cleaning. At Station 70+00 the toe drain empties into an open ditch draining to the South Meadows Pumping Station and the remaining toe drain from Station 70+00 to Station 7+00± drains into the open ditch through laterals. It is important that the open ditch be maintained and the water level be kept low to prevent plugging of the system.

(4) (a) Side drains are provided along both sides of the Park River Conduit in the areas where the fill over the conduit is light. The drains are provided to lower the ground water in the vicinity of the conduit as a guard against floatation which is possible if the ground water is high and water within the conduit is low. The drains are designed the same as toe drains and are provided with outfalls into the Park River Conduit equipped with flap valves and gate valves.

(b) The drain on the south side of the conduit from Station 52+49 to the drain chamber at Hudson Street is continuous. The drain on the north side from Station 52+49 drains into the suction chamber of the Bushnell Park Pumping Station then starts again below the station to a drain chamber at Hudson Street. The drains start again at Station 39+00 below Hudson Street and are continuous to the drain chambers below Commerce Street at Station 14+33.

(c) The maintenance crew should remove any silt that may collect in the lines and inspect the flap valves for proper operation to assure proper functioning of the system.

d. From the lower end of Clark Dike to Station 41+50+, parallel to the Dike centerline and approximately 50 feet in from the landside toe is the 39-inch Franklin Avenue Interceptor Sewer. Frequent inspections should be made by the maintenance crew along the landside slope and the toe drain laterals for possible leaks in the sewer.

e. The grassed slopes should be cut regularly to promote good turf and not allowed to go to hay. The grass should be cut back when it reaches a height of about 8 inches to about 4 inches.

f. When sections of the dike require reestablishment of turf seeding operations should be started at the earliest practicable date in the spring to secure the greatest possible protection against erosion. Areas requiring seeding shall be dressed to fill gullies, and irregularities in the surface. The surface should then be raked or harrowed parallel to the contour of the dike (never up and down) to a depth of three-quarters of an inch. After the seed is sown the surface shall be lightly raked with iron rakes and all surfaces lightly rolled. The University of Connecticut or a recognized agronomist should be contacted for the purpose of analyzing the soil to determine if lime is needed and what fertilizer or seed mixture is best suited to the local conditions.

4-03. Operation. - a. The regulations prescribed by the Secretary of War under Paragraph 208.10 (b) (2) give rules for the operation of levees. These rules apply just as well to earth dikes and are quoted here to avoid cross reference to the regulations.

> "Levees. - (1) Operation. - During flood periods the levee shall be patrolled continuously to locate possible sand boils or unusual wetness of the landward slope and to be certain that:
>
> (i) There are no indications of slides or sloughs developing;
>
> (ii) Wave wash or scouring action is not occurring;

(iii) No low reaches of levees exist which may be overtopped;

(iv) No other conditions exist which might endanger the structure.

Appropriate advance measures will be taken to insure the availability of adequate labor and materials to meet all contingencies. Immediate steps will be taken to control any condition which endangers the levee and to repair the damaged section.

b. Operation as referred to the use of dikes may be at a time of moderate high water such as a spring freshet or may be when unusual conditions indicate the possibility of dangerous flood heights. A map and tables in a later section will show elevations at which the various parts of the system should be operated such as: Checking flap valves and check valves, closing valves, installing stoplogs, manning pumping stations and patrolling dikes. Floods on the Connecticut River do not give much time in which to make extensive preparations, therefore prompt action in starting work is of utmost importance.

c. Operation of the protective system depends on the river stage at the various items. The patrolling of the dikes depends on the depth of water against the riverside slope and for convenience will be referred to river stage as recorded by the United States Weather Bureau at Memorial Bridge.

(1) Only occasional patrolling of the dikes should be necessary until a river stage of 24.0 feet is reached at which time a thorough examination should be made at intervals of not more than four hours. As the water rises, the interval between examinations should be shortened until, at major flood stages, the dikes are examined at hourly intervals, with special watchmen being assigned, if necessary, at places which might become dangerous.

(2) Patrolmen should be thoroughly instructed as to their duties, what they are to watch out for and the exact limits of their beat. On each journey of inspection they should carefully examine both slopes of the dike for: Seepage or wetness on landside slope, sand boils at or near the landside toe, wave wash or scouring on riverside slope, and that no slides or sloughs are developing.

(3) Unauthorized traffic on the dikes should not be allowed at any time and patrolmen should be instructed to keep people off the dikes unless they can show passes or credentials authorizing their presence.

(4) Plans should be made for a system of one-way traffic on the dikes in time of flood for bringing in supplies that may be needed. In the event that materials are urgently needed at a point, trucks can be routed both ways, and after depositing their loads, driven down the landside slope.

4-04. Emergency Repair Methods. - a. Scours. - Careful watch shall be maintained over stretches of the dike where scouring is likely to occur, such as slopes not protected by riprap, blanketed foreshores, and particularly angles in the dike alignment where it is subjected to heavy currents, even though the slope is protected by riprap. If any indication of scouring is observed, soundings should be taken to observe the amount and progress of the scour. Sandbagging or dumped rock will generally afford the most practicable means of combatting this condition. The open ends of sandbags, so used, must be sewed or tied after filling with earth.

b. Wave Wash. - Dikes may be subjected to wave wash on broad reaches of water even though the direct action of high wind is impeded by natural barriers such as trees. Well-sodded slopes will usually withstand waves from a storm of about an hour's duration without serious damage. An attack over a longer period may become serious and the slopes should be protected by sacking or equivalent protection. Extent of washes can be observed by wading along the attacked slope. Sandbags should be placed in the erosions in as effective a manner as possible, carrying the protection well above the action of the waves. Sandbags used for this purpose require only about one-half cubic foot of material and should be sewed or tied. The aim is to obtain a maximum of coverage with only sufficient weight to hold the sack in place.

c. General. (1) A sand boil is the result of a transfer of pressure head and seepage from the river through a pervious stratum near or at the surface to the landside of the levee. This seepage under pressure tends to push its way to the surface and actually floats the material through which it flows. Provided the weight of the relatively impervious soil layer overlying the pervious stratum, in which the flow under pressure is occurring, is sufficient to counterbalance this pressure, no harmful effect results. When the soil stratum overlying the pervious layer is insufficient to counterbalance the upward pressure or when no such stratum exists, boils break through the surface on the landside wherever these weaknesses are present. The sand boil may discharge relatively clear water or the discharge may contain quantities of sand and silt, depending upon the magnitude of the pressure and the size of the boil.

(2) Effects of Sand Boils. - Sand boils can produce three distinctly different effects on the levee, depending upon the condition of flow under the levee. These three effects are illustrated by the following figures. In Figure 1, Plate IIIA, Appendix "D", the seepage flow develops a definite pipe or tube under the levee. This breaks out at the landside toe in the form of one or more large sand boils. Unless checked, this flow causes a cavern to be developed under the levee, resulting in subsidence of the levee and subsequent overtopping. This case can be most easily recognized by slumping of the levee crown. Figure 2, Plate IIIA, Appendix "D" illustrates the case where seepage flows under pressure under the levee without following a defined path, as was the case above. This flow results in one or more boils outcropping at or near the landside toe. The flow from these boils tends to undercut and ravel the slope, resulting in a sloughing of the slope. Evidence of

this type of failure is found in undercutting and ravelling at the landside toe. Figure 3, Plate IIIA, Appendix "D" shows a third type of effect of a sand boil. In this case, numerous small boils, many of which are scarcely noticeable, outcrop at or near the toe. While no boil may appear to be dangerous in itself, the consequence of the group of boils is to cause floatation of the soil, thereby reducing the shearing strength of the material at the toe, where maximum shearing stress occurs, to such an extent that failure of the slope through sliding results.

(3) General Instructions for Handling Sand Boils. - All sand boils should be watched closely. All boils should be marked conspicuously with flagging so that patrols can locate them without difficulty and observe changes in their condition. A sand boil which discharges clear water in a steady flow is usually not dangerous to the safety of the levee. The only action necessary in this case is to drain the excess water off to prevent it from standing near the levee. However, if the flow of water increases, and the sand boil begins to discharge material, corrective action should be undertaken immediately.

(4) Method of Treatment.

(a) The accepted method of treating sand boils is to construct a ring of sand bags around the boil, building up a head of water within the ring sufficient to prevent further movement of sand and silt. The accepted method of ringing a sand boil is as follows:

1. The entire base of the sack ring is cleared of debris, in order to provide a watertight bond between the natural ground and the sack ring.

2. The sacks are then laid in a ring around the boil, with joints staggered, and with loose earth between all sacks.

3. The ring is carried only to a height sufficient to prevent material from being discharged. The ring should not entirely stop the flow of water, because of the probability of the excessive local pressure head causing additional ruptures of impervious strata and boils nearby.

4. A "V" shaped drain constructed of two boards, or a piece of sheet metal, is then placed near the top of the ring to carry off the water.

(b) Actual conditions at each sand boil will determine the exact dimensions of the ring. The diameter and height of the ring depend upon the size of the boil, and the flow of water from it. In general, the following considerations should govern:

1. The base width should be no less than 1-1/2 times the contemplated height.

2. It is well to include weak ground near the boil within the ring, thereby preventing a break through later.

3. The ring should be of sufficient size to permit sacking operations to keep ahead of the flow of water.

(c) Where many boils are found to exist in a given area, a ring levee of sand bags should be constructed around the entire area and, if necessary, water should be pumped into the area to provide sufficient weight to counterbalance the upward pressure.

d. Sloughs. - During prolonged high water stages, seeping and sloughing conditions on the back slopes may occur. Such conditions should be observed closely as to progress of seepage up the back slope and the amount of material that is being carried by the water. If the seep velocity becomes great enough to cause, or probably cause, erosion or sloughing of the slope, a sandbag covering should be placed on the seeping area, beginning well out from the toe and progressing up the slope. The covering should extend several feet beyond the saturated area. If the material is obtainable, the affected area should be covered with brush, straw or similar permeable material, to a depth of two to four inches before placing the sandbag cover. This will permit the seep water to get away while serving as a filter to prevent loss of earth from the dike. After the covering is placed, close observation should be maintained and additional layers of sandbags placed on the previous ones until the velocity of the seepage is reduced to a point at which the amount of material carried is negligible.

e. Raising Existing Earth Dikes. - In emergency, time and other conditions permitting, the grade of a dike can be reasonably safely raised by at least three feet. The method most commonly used for this purpose is outlined in the following paragraphs and illustrated by exhibits attached.

(1) Sandbag Topping. - The sack ordinarily used for topping an earth dike is such as is used for grains or other feeds and holds 100 pounds of grain. Smaller sacks may be used if feed sacks are not available. Grain sacks, filled with about one cubic foot of earth, weighing about 100 pounds, will provide a unit about 6 inches high, one foot wide and two feet in length.

The sacks may be filled at the source of material and hauled to the dike or filled with stockpile or borrow areas at the dike, conditions determining the method employed. The same is true of filling; i.e., power or hand methods.

The open end of the sacks should always face upstream or toward the riverside of the dike and need not be sewed or tied. When the sack faces the river the loose end should be folded under and when facing upstream the loose end covered by the succeeding sack.

The front line of sandbags in the first layer should be laid parallel to the dike center line and remaining bags at right angles to the center line. The sandbags in the second layer are all laid at right angles to the center line, the third row similar to the first, etc., as shown on attached sketch Plate No. 1, Appendix "D". All sacks should be well mauled or tramped into place. The sacks should be filled

to two-thirds capacity when flattened out to facilitate proper placing and prevent bursting the sack when mauled or tramped into place.

Plate No. 1, Appendix "D" illustrates the progressive method of increasing the dike height and gives an approximation of the number of sacks required for dikes of various heights.

A crew of 50 men should fill, carry and place approximately 1500 sacks per 8-hour day, all hand labor, when the source of material is within 150 feet of the point of placement. Production will depend on conditions at the site.

SECTION V

Flood Walls

5-01. Description. - The walls are of the reinforced concrete cantilever type, consisting of a vertical wall, or stem, on a base with a key and a steel sheet piling cutoff wall. Drains are provided on the landside of the wall to collect seepage water. The walls were then backfilled up to natural ground to provide surface drainage.

5-02. Maintenance. - a. The following quotations from the regulations govern the maintenance of flood walls.

"Periodic inspections shall be made by the Superintendent to be certain that:

(1) No seepage, saturated areas, or sand boils are occurring;

(2) No undue settlement has occurred which affects the stability of the wall or its water tightness;

(3) No trees exist, the roots of which might extend under the wall and offer accelerated seepage paths;

(4) The concrete has not undergone cracking, chipping, or breaking to an extent which might affect the stability of the wall or its water tightness;

(5) There are no encroachments upon the right-of-way which might endanger the structure or hinder its functioning in time of flood;

(6) Care is being exercised to prevent accumulation of trash and debris adjacent to walls, and to insure that no fires are being built near them;

(7) No bank caving conditions exist riverward of the wall which might endanger its stability;

(8) Toe drainage systems and pressure relief wells are in good working condition, and that such facilities are not becoming clogged.

Such inspections shall be made immediately prior to the beginning of the flood season, immediately following each major high water period, and otherwise at intervals not exceeding 90 days. Measures to eliminate encroachments and effect repairs found necessary by such inspections shall be undertaken immediately. All repairs shall be accomplished by methods acceptable in standard engineering practice."

b. Drains. - (1) A toe drain is provided at the beginning of the concrete wall at Memorial Bridge from Station 0+70± to Station 4+50± with the outfall to the railroad ditch.

(2) In the area from Station 4+71.19 to Station 22+08.65, there is a horizontal gravel drain without vitrified clay pipe at the subgrade elevation of the wall which is provided with vertical gravel drains on 200 foot centers to the surface of the landside backfill. The drain was required in the flood wall design as protection against uplift affecting the stability of the wall.

(3) A pipe drain is provided behind the concrete wall at the Dutch Point Plant from Station 35+81 to Station 43+82 draining from both ends to a manhole at Station 41+02. The manhole drains to a yard sump of the Hartford Electric Light Company and from the sump to the river by gravity in normal times and during high water by pump provided by the Hartford Electric Light Company.

c. The expansion joint material serves to protect the copper water stop against damage. When the expansion joint material has deteriorated to the point where it no longer serves its purpose the loose material should be cleaned out, care being exercised not to injure the copper seal, and the joint poured full with asphalt.

5-03. Operations. - a. The following quotations from the regulations govern the operations of walls.

"Continuous patrol of the wall shall be maintained during flood periods to locate possible leakage at monolith joints or seepage underneath the wall. Floating plant or boats will not be allowed to lie against or tie up to the wall. Should it become necessary during a flood emergency to pass anchor cables over the wall, adequate measures shall be taken to protect the concrete and construction joints. Immediate steps shall be taken to correct any condition which endanger the stability of the wall."

b. The recommendations made in paragraph 4-03 b for dike apply equally as well for the operation of the walls.

5-04. Emergency Repair Methods. - a. Sand boils. - See Section IV, Paragraph 4-04 c for a description and treatment of sand boils.

b. Monolith joints. - If vertical monolith joints have appreciable leakage, they can be controlled by dumping cinders, sand, or other such material on the riverside of the wall and the dumped material will be carried into the joint by the water and plug the leak.

c. Raising grade of wall. - In the event there is danger of the walls being overtopped by the flood, they can be raised reasonably safe, to three feet above their present grade. One tier of sandbags placed on top of the wall will raise the grade approximately six inches and afford protection against wave action. If the wall grades are to be

raised beyond six inches, it can be best accomplished by erecting a wooden extension such as shown on Plate IV of Appendix "D".

SECTION VI

Drainage Structures

6-01. Description. - The drainage structures consist of sewer and drainage pipe passing through or under the dikes and flood walls. The pipes or conduits all have facilities to prevent backwater from flooding the city. The location of the drainage structures are shown on Plates of Appendix "D" listed below to facilitate their location.

Location	Description	Discharge Elevation (U.S.W.B.)
Station 11+04 - North Meadows Dike	North East Sewer Outfall	2.45
Station 38+89.42 Riverfront Dike	Sanitary Sewer (6")	13.23
Station 56+49 Riverfront Dike	Masseek Street Sewer	3.60
Station 84+21 Riverfront Dike	12-inch Roof Drain	22.27
Station 89+03.65 Riverfront Dike	12-inch Ash Pit Drain	8.55+
Station 90+75 Riverfront Dike	10-inch Ash Pit Drain	17.32
Station 41+50 South Meadows Dike	Sewage Disposal Conduit	1.55

6-02. Maintenance. - The following quotations from the regulations govern the maintenance of drainage structures.

"Adequate measures shall be taken to insure that inlet and outlet channels are kept open and that trash, drift or debris is not allowed to accumulate near drainage structures. Flap gates and manually-operated gates and valves on drainage structures shall be examined, oiled and trial-operated at least once every 90 days. Where drainage structures are provided with stoplog or other emergency closures the condition of the equipment and its housing shall be inspected regularly and a trial installation of the emergency closure shall be made at least once every year. Periodic inspections shall be made by the Superintendent to be certain that:

1. Pipes, gates, operating mechanism, riprap, and headwalls are in good condition;

2. Inlet and outlet channels are open;

3. Care is being exercised to prevent the accumulation of trash and debris near the structures and that no fires are being built near bituminous coated pipes;

4. Erosion is not occurring adjacent to the structure which might endanger its water-tightness or stability.

Immediate steps will be taken to repair damage, replace missing or broken parts, or remedy adverse conditions disclosed by such inspections."

b. Markers should be placed to locate each drainage structure that passes through the protection system so that they can be readily found during flood periods.

6-03. Operation. - a. The following quotations from the regulations govern the operation of drainage structures:

"Whenever high water conditions impend, all gates will be inspected a short time before water reaches the invert of the pipe and any object which might prevent closure of the gate shall be removed. Automatic gates shall be closely observed until it has been ascertained that they are securely closed. Manually-operated gates and valves shall be closed as necessary to prevent inflow of flood water. All drainage structures in levees shall be inspected frequently during floods to ascertain whether seepage is taking place along the lines of their contact with the embankment. Immediate steps shall be taken to correct any adverse condition."

b. The majority of the drainage structure discharges are at low water elevations, therefore it is important that inspections be made whenever river conditions permit to insure the proper functioning of the flap valves, backwater gates and sluice gates during periods of high water.

c. For the sequence of operation of the drainage structures requiring attention when a flood is imminent, see Plate No. V A of Appendix "D".

SECTION VII

Closure Structures

7-01. Description. - a. The closure structures are of two types, the bulkhead door type, and the stop log type, and are provided to permit passage through the flood protection system during non-flood periods. A brief description of each closure starting at Stoplog No. 1 at the upper end of the protection system is given below. (See Plate No. V of Appendix "D"). All sill elevations are on U. S. Weather Bureau datum.

(1) Stoplog No. 1. - This structure is a railroad stoplog for a double track main line of the New York, New Haven and Hartford Railroad (Springfield Division) having a clear opening of 31.0 feet and sill elevation of 30.7. The closing of this structure requires the removal of the rails.

(2) Stoplog No. 2. - This structure is a railroad stoplog for a single track line of the New York, New Haven and Hartford Railroad to Willimantic, Connecticut and railroad roundhouse in East Hartford, Connecticut having a clear opening of 18 feet 11 inches and sill elevation of 35.7. In closing this opening, it is not necessary to remove the rails as the lower stoplogs are formed to fit around them. This track becomes inoperative before the water reaches the sill by the closing of the East Hartford Stoplog Closure which has a sill elevation of 33.5.

(3) Bulkhead door. - This opening is located in the upper end of the flood wall at the South Meadows Plant of the Hartford Electric Light Company having a clear opening of 3-1/2 feet by 7 feet and sill elevation of 32.55. This opening provides access through the wall for the Standard Oil Company to their oil-loading dock.

(4) Stoplog No. 3. - This structure has a clear opening of 6 feet and a sill elevation of 31.5 and provides a walkway from the South Meadows Plant of the Hartford Electric Light Company to their upper screen house.

(5) Stoplog No. 4. - This structure is a railroad stoplog for a siding at the South Meadows Plant of the Hartford Electric Light Company having a clear opening of 14 feet and sill elevation of 30.7. The bottom stoplogs are notched to fit around the rails so their removal is unnecessary.

(6) Stoplog No. 5. - This structure is a highway stoplog near the South Meadows Pumping Station, providing access to the bulk station of the Beacon Oil Company having a clear opening of 15.0 feet and sill elevation of 29.0.

(7) Stoplog No. 6. - This structure is a railroad stoplog for main line and siding of the Valley Branch of the New York, New Haven and Hartford Railroad and has two openings of 18.0 feet each and sill elevations of 28.3. The closing of this structure requires the removal of the rails.

7-02. Maintenance. - a. The following quotations from the regulations govern the maintenance of closure structures. "Closure structures for traffic openings shall be inspected by the Superintendent every 90 days to be certain that:

1. No parts are missing;

2. Metal parts are adequately covered with paint;

3. All movable parts are in satisfactory working order;

4. Proper closure can be made promptly when necessary;

5. Sufficient materials are on hand for the erection of sand bag closures and that the location of such materials will be readily accessible in times of emergency.

Tools and parts shall not be removed for other use. Trial erections of one or more closure structures shall be made once each year, alternating the structures chosen so that each gate will be erected at least once in each three-year period. Trial erection of all closure structures shall be made whenever a change is made in key operating personnel. Where railroad operation makes trial erection of a closure structure infeasible, rigorous inspection and drill of operating personnel may be substituted therefor. Trial erection of sand bag closures is not required. Closure materials will be carefully checked prior to and following flood periods, and damaged or missing parts shall be repaired or replaced immediately."

7-03. Operation. - a. The following quotations from the regulations govern the operation of closure structures.

"Erection of each movable closure shall be started in sufficient time to permit completion before flood waters reach the top of the structure sill. Information regarding the proper method of erecting each individual closure structure, together with an estimate of the time required by an experienced crew to complete its erection will be given in the Operation & Maintenance Manual which will be furnished local interest upon completion of the project. Closure structures will be inspected frequently during flood periods to ascertain that no undue leakage is occurring and that drains provided to care for ordinary leakage are functioning properly. Boats or floating plant shall not be allowed to tie up to closure structure or to discharge passengers or cargo over them.

b. The location of these structures is indicated on Plate No. V of Appendix "D" which also shows the gage reading (United States Weather Bureau) at which the openings should be closed to prevent flooding of the area back of the openings. Public and private parties whose passage through the closure structures are affected by the stopping of the gap should be notified of the intended closing in sufficient time to permit them to perform the necessary evacuation and protection of the public safety. Determination of the time at which any closure erection should be started must be based upon the rate of river rise and time required for installation. The following table shows the estimated time necessary for a trained crew equipped with the necessary tools, parts and material at the site to completely install the closures:

Closure	Size of Crew	Time Required
Stoplog No. 1 - North Meadows Dike	15 men	4 hours
Stoplog No. 2 - North Meadows Dike	16 men	3 hours
Bulkhead Door - Riverfront Dike	1 man	1/2 hour
Stoplog No. 3 - Riverfront Dike	4 men	2 hours
Stoplog No. 4 - Riverfront Dike	10 men	2-1/2 hours
Stoplog No. 5 - South Meadows Dike	10 men	2-1/2 hours
Stoplog No. 6 - South Meadows Dike	10 men	4 hours

The above estimated figures are based on hand labor and using two sets of double block and tackle for hoisting the logs into place.

c. After the stoplog timbers are in place, the openings where the rails are not removed shall be plugged with sandbags and sufficient ballast shall be removed to assure a satisfactory seal. The placing of canvas or sisalcraft paper on the riverside face of the stoplog will prevent undue leakage of water through the cracks between the timbers with two tiers of sandbags at the bottom to securely anchor the canvas and seal the joint between the first log and the sill. It is not necessary to sandbag behind the stoplog as structural grade timbers are provided and will withstand the pressure. The top timbers in the closure should be wedged in place to prevent their tendency to float.

(1) Ample time should be allowed to erect the closures and due allowance must be made for the delays in operation occasioned by inexperienced help and other contingencies. The height of the predicted flood may eliminate a complete closure; however, the intial closing should allow at least a three-foot freeboard.

(2) Care should be exercised to avoid removal of stoplogs during a temporary recession of flood waters which might be followed immediately by a second crest. When all danger from the flood has passed remove the timbers and removable supports, clean them, repair any damage, and return all parts to the respective storage sheds at the site.

SECTION VIII. UTILITIES THROUGH THE PROTECTION SYSTEM

8-01. Description. - a. In addition to pumping station conduits and drainage structures passing through the flood protection system, there are public utilities, pipes, and flumes necessary to operation of the Dutch Point and South Meadows Plants of the Hartford Electric Company and pipe sleeves for future installations. The utilities at the Dutch Point Plant are shown on Plate No. XIX A of Appendix "D" and those at the South Meadows Plant on Plates Nos. XXIII to XXVI, inclusive. Those not located in the vicinity of the plants are listed below for reference and are shown on plates of Appendix "D".

Location	Description	Invert Elevation (USWB)
Sta. 148+88 North Meadows Dike	6" gas main	13.5+
Sta. 15+81.19 Riverfront Dike	48" R.C. Pipe (Plugged with Concrete	14.88 ℄ of wall
Sta. 16+40.54 Riverfront Dike	6" C.I. Pipe Sleeve (Plugged)	12.84 ℄ of wall
Sta. 68+47.19 Riverfront Dike	6" Oil Line	19.24 Steel Sheet Piling.
Sta. 69+02 Riverfront Dike	2 - 4" Electric Cables	6.75 Steel Sheet Piling
Sta. 79+71 Riverfront Dike	Submarine Cable	8.0+ Steel Sheet Piling
Sta. 80+55.1 Riverfront Dike	8" Steel Pipe (Capped both ends)	29.93 Landside Face of Wall.
Sta. 80+57.62 Riverfront Dike	8" Oil Line	29.94 Landside Face of Wall.
Sta. 80+59.47 Riverfront Dike	8" Oil Line	29.95 Landside Face of Wall.
Sta. 80+61.92 Riverfront Dike	8" Oil Line	29.96 Landside Face of Wall.
Sta. 7+25 South Meadows Dike	5 - 6" Oil Lines 1 - 1" Air Line	23.55 Riverside Face of Dike

8-02. Maintenance. - a. The utilities passing through the protection system are constructed with seals against leakage and are equipped with flap valves, gate valves, or sluice gates. The flap gates and manually-operated gates and valves on the utilities shall be examined, oiled and trial operated at least once every 90 days. Markers should be placed to locate each utility that passes through the protection system so that they can be readily found during flood periods.

There are a number of suction and discharge pipes and conduits at the Dutch Point and South Meadows Plants of the Hartford Electric Light Company that are circulating systems and are not protected by gates and valves. Inspections shall be made to be certain that the pipes and conduits are intact and do not have cracks or bad joints that will cause excessive leakage during high water.

8-03. Operations. - a. The utilities through the protection system do not require special attention during high water. However, they should be examined during the patrolling operations to be certain that no seepage is occurring along the utility line and that flap valves are functioning properly.

SECTION IX. PRESSURE CONDUITS

9-01. Description. - a. There are two reinforced concrete conduits in the flood protection works to handle surface drainage and sewage behind the flood walls and dikes.

b. The Park River Conduit handles the flow of the Park River and surface water of the City during storms and in the event of high water also handles sewage. The conduit from the outlet to Hudson Street was constructed in the old Park River streambed and across Bushnell Park above Hudson Street when the river made a long sweeping bend to a junction with the river approximately 1000 feet below Broad Street.

c. The Gully Brook Conduit is a storm sewer with its beginning in Keeney Park and runs through the City to discharge into the Park River Conduit approximately 600 feet below the inlet of the Park River Conduit. Approximately 2300 feet of the existing sewer was rebuilt to withstand the increased pressures plus 800 feet across Bushnell Park to connect to the Park River Conduit.

9-02. Maintenance. - a. The only maintenance to the conduits will be the checking of check and gate valves in the side drain discharges of the Park River Conduit and backwater gates and sluice gates of the various sewer discharges into both conduits.

The discharge of the Park River Conduit is Elevation Minus 2.96 m.s.l. and mean low water of the Connecticut River is Elevation 1.45. There will be material deposited in the lower end of the conduit due to the Connecticut River backwater. It will not be necessary to remove this material as an obstruction to the proper functioning of the conduit as it will be removed by the Park River discharge as it approaches its maximum designed capacity.

9-03. Operation. - a. During high water the Park River Conduit should be patrolled for possible leaks at the expansion joints and can be detected by excessive moisture over the conduit, or water rising in the manholes of the side drain in excess of ground water seepage.

SECTION X. PUMPING STATIONS

10-01. DESCRIPTION. - The area protected by the Hartford Dike System is divided into four drainage systems for the purpose of handling sewage and storm water. Each main drainage area has a pumping station to pump the sewage and storm water into the river at periods of high river stages.

a. The area north of the Memorial Bridge behind the North Meadows dike contains the North Meadows Pumping Station. The station consists of a concrete substructure with a brick and structural steel superstructure housing three 36-inch gasoline-engine-driven volute pumps and one 16-inch electrically-driven volute pump. As there is no practicable outside source of three phase power available for energizing the 16-inch volute pump and station auxiliaries, two gasoline-driven electric generators are provided - one a 75 KW unit capable of running the 16-inch pump and all station auxiliaries. A well point system is provided with duplicate electrically driven water pumps to furnish a water supply for engine cooling water and general use around the station.

b. The area of downtown Hartford around Bushnell Park is drained toward the northeast corner of the Park. A temporary pumping station was constructed at this point in 1943 that pumps the sewage and storm water from this area into the Park River Conduit at high river stages. The station contains one of the 36-inch gasoline-engine-driven volute pumps that was originally in the North Meadows Station.

c. The east section of the business district drains toward the Keeney Lane Pumping Station located on the right bank of the Connecticut River - just north of the Park River Conduit. This station is a temporary station, housing another of the gasoline-engine-driven volute pumps originally in the North Meadows Pumping Station.

d. At the southerly end of the flood control system there is the South Meadows Pumping Station designed and constructed by the City of Hartford prior to any Government construction of flood control works.

e. The temporary pumping stations at Bushnell Park and Keeney Lane will be enlarged when materials and equipment become available and the equipment borrowed from the North Meadows Pumping Station returned and installed.

10-02. MAINTENANCE. - a. The following quotations from the regulations govern the maintenance of pumping stations:

"Pumping plants shall be inspected by the Superintendent at intervals not to exceed 30 days during flood seasons and 90 days during off-flood seasons to insure that all equipment is in order for

instant use. At regular intervals, proper measures shall be taken to provide for cleaning plant, buildings, and equipment, repainting as necessary, and lubricating all machinery. Adequate supplies of lubricants for all types of machines, fuel for gasoline or diesel powered equipment, and flash lights or lanterns for emergency lighting shall be kept on hand at all times. Telephone service shall be maintained at pumping plants. All equipment, including switch gear, transformers, motors, pumps, valves, and gates shall be trial operated and checked at least once every 90 days. Megger tests of all insulation shall be made whenever wiring has been subjected to undue dampness and otherwise at intervals not to exceed one year. A record shall be kept showing the results of such tests. Wiring disclosed to be in an unsatisfactory condition by such tests shall be brought to a satisfactory condition or shall be promptly replaced. Diesel and gasoline engines shall be started at such intervals and allowed to run for such length of time as may be necessary to insure their serviceability in times of emergency. Only skilled electricians and mechanics shall be employed on tests and repairs. Operating personnel for the plant shall be present during tests. Any equipment removed from the station for repair or replacement shall be returned or replaced as soon as practicable and shall be trial operated after reinstallation. Repairs requiring removal of equipment from the plant shall be made during off-flood seasons insofar as practicable."

b. General. - Proper maintenance of the pumping stations requires periodic operation of all equipment at frequent intervals to keep equipment in good working order and all parts well lubricated and free from corrosion. Periodic operation of equipment also permits an inspection of the functioning of all equipment so that defective parts may be properly replaced or repaired before their use is required for pumping operations. Inasmuch as mechanical and electrical equipment deteriorates more rapidly from idleness than from continued use, a thorough and complete maintenance routine is justified.

The heating systems should be kept in operation during the colder months to prevent freezing of water in pipes and cooling water jackets, and also to prevent condensation of moisture on equipment within the building.

c. Gasoline engines. - Once a week, all gasoline engines should be run for two hours. The operation of the engines for this length of time is necessary to get the crankcase oil warmed up sufficiently to evaporate any gasoline that entered the crankcase during starting and to evaporate any moisture that is in the crankcase oil due to condensation. During this period of operation the functioning of the engine and accessories should be checked for proper performance. The following are the principal items to be checked.

(1) Water temperature.

(2) Ignition - open all ignition switches but one and test each ignition circuit separately in this manner.

(3) Heating of cylinder blocks - place hand on different portion of each block. Temperatures should be approximately equal.

All engines should be run at full rated speed during the maintenance routine after a five minute warm-up period at 600 R.P.M. When insufficient water is available for pumping the flexible couplings between the engines and the gear units should be disconnected. The pumps should never be operated more than fifteen seconds without water covering both sets of wearing rings because the bronze wearing rings in the pump require water for lubrication. Operation of a pump for an extensive length of time without water around the wearing rings could result in the rings freezing together, thus requiring extensive repair work.

The oil in the engines should be changed twice a year or after every 100 hours of operation, whichever is more frequent. At the time of oil changing the oil filters should be removed and cleaned.

The valve in the engine exhaust drain line should be opened after each operation of the engines, but only after the water pumps have been stopped for a sufficient length of time to allow the water system to be drained. The valve in the engine exhaust drain should never be opened when one of the water pumps is in operation because there would be a possibility of water from the cooling water system being forced into the engine exhaust system and backing up into the engine cylinders.

d. Pumps. - (1) Once each month the flexible coupling between the engines and the gear units should be assembled and the pump run at one-half speed for approximately five seconds. The pump should be greased after every five hours of operation.

(2) The 16-inch volute pump should be turned once a week by running the motor for about three seconds. This will allow the motor and pump to come up to approximately one-half speed and thus spread a film of oil over all bearings.

(3) The sump pumps should be started once a week and run for a short period of time.

e. Switchboard, wiring and motors. - The switchboard should be completely checked once a year. Insulators should be cleaned, all lugs and connections checked and tightened, and ground connections checked for continuity. The insulation resistance of all circuits and motors should be measured once a year. The result of each of these measurements should be plotted on a chart with insulation resistance as the abscissa and time in years as the ordinate. This will show the change in condition of circuits and motors from year to year and will allow remedial measures to be taken before breakdown occurs.

Rings and commutators should be cleaned yearly, and motors and the generator blown out with dry compressed air at similar intervals.

f. Gear units. - The gear units should show a positive pressure on the pressure gage at all times while in operation. If there is no pressure the unit should be immediately shut down and the cause of the lack of oil determined.

g. Gates and valve. - All gates and valves should be raised or lowered a short distance weekly. The hydraulically operated gates should be moved through a complete closing and opening cycle monthly. At this same monthly interval the sills of the gates should be cleaned of silt and debris.

h. Storage batteries. - The storage batteries should be kept properly filled with distilled water. Water from the municipal system should not be used. The batteries should be kept fully charged at all times. The specific gravity of the batteries at full charge is between 1.210 and 1.225.

It is important to keep the tops of the batteries clean because a layer of foreign material, such as dirt, grease or moisture will allow small currents to flow between terminals thus discharging the battery constantly.

i. Fire protection equipment. - All carbon dioxide cylinders should be weighed every six months to determine their condition. The gross weight of each cylinder, fully charged, is stamped on the cylinder. If the gross weight is less than that stamped on the cylinder, the cylinder should be promptly recharged.

j. Heating system. - The boilers should be cleaned once a year by opening the mud valves at the base of the boiler and drawing off the sediment. Each fall before the heating systems are put into operation the oil burner and controls should be thoroughly checked by a competent oil burner mechanic.

k. Painting. - All metal surfaces not otherwise protected must be kept painted to maintain the metal in good condition. The exterior metal work, such as pipe railings, trash racks, cover plates, exterior gate hoist, will require frequent painting because of exposure to the weather.

The silencers should be kept painted with a high temperature paint.

l. Silencers. - Due to the horizontal position of some silencers, moisture will collect within the silencers and corrode the inside. It is suggested that, if possible, the drain plugs on these silencers be removed and the drain holes left open. The small increase in noise due to these open holes will not be noticeable from the ground.

m. Anchor bolts. - At yearly intervals all anchor bolts, piping bolts, pump assembly bolts, and all similar parts shall be checked for tightness and tightened if necessary.

n. Draining water in pumping station. - If, due to the failure of the heating system in cold weather, it becomes necessary to drain all water in the building the following steps should be taken.

(1) Open drain valve at low point in water lines.

(2) Open gate valves and quick-opening valves in water supply lines at all engines.

(3) Open all petcocks on engines.

(4) Drain flexible water cooled exhausts on engines.

(5) Drain sanitary fixtures and open all traps.

(6) Drain boiler and heating system.

o. Lubrication. - The two main requirements to keep equipment well lubricated are to operate equipment frequently to spread a film of lubricant over the bearing surfaces, and secondly to use proper kinds and grades of good lubricants. As greases cake and harden in time, bearings should be disassembled periodically, cleaned, and repacked with fresh grease. Cup greases should not be used on the equipment for any purpose because most cup greases have water as a binder. This moisture in contact with idle metal surfaces will corrode them in time.

The following is a tabulation of the types and grades of lubricants to be used on the equipment in the pumping station and the intervals between their application and change.

(1) Engines. - A good grade of automotive oil for crankcase use should be used having a viscosity as recommended by the engine manufacturer. Change oil and clean oil filter every six months - preferably just before pumping operations in the spring and again in the fall.

After every thirty hours of operation a few drops of light bearing oil should be applied to the oil cups, and the grease cups turned down or refilled with a light pressure grease.

(2) Gear units. - A good grade of automotive oil should be used. Change oil and clean oil filters every two years.

(3) Volute pump. - The use of Keystone Velox No. 3 grease for the shaft packing gland on the pumps is recommended. The cups should be turned down a little after every few hours of operation and refilled when empty.

The grease cups on the pump bearings and the steady bearing should be filled with a light ball bearing grease. The grease cups on these bearings should be turned down, but only a little, after every thirty hours of operation. Anti-friction bearings will fail just as rapidly because of too much grease as from too little.

The two bearings on the volute pump and the steady bearing should be disassembled every three years, cleaned, and covered with a film of grease.

(4) Motor and generator bearings. - A good bearing oil SAE - 20 should be used in the sleeve bearings of the generators, the bearings of the volute pump motor, and the bearings of the small motors throughout the pumping station. The generator bearings and volute pump motor bearings should be drained, flushed out with kerosene, and refilled every two years.

(5) Crane. - The grease fittings on the cranes should be lubricated once a year with a pressure grease.

(6) Sump pump. - Once a month grease all pump fittings with Keystone Velox No. 3 grease, using a high pressure grease gun.

p. Manufacturers' drawings and recommendations. - (1) The U. S. Engineer Office has furnished the City of Hartford a complete set of manufacturers' drawings pertaining to the mechanical and electrical equipment in the pumping station, and copies of factory acceptance tests on the equipment. The drawings should be kept in good condition and available for reference at all times. If, for any reason, the drawings become damaged or lost they should be replaced. The manufacturers will replace drawings for a nominal cost.

(2) The Operating and Maintenance Instructions of the engine manufacturer's should be followed for gasoline engine care. There follows a list of manufacturers' publications which should be followed for operation and maintenance of other equipment.

(a) Generators. - Instructions GEH-709G Large Horizontal Motors and Generators - D.C. and Synchronous A.C. Machines.

Instructions GEH-67E Direct-Connected Exciters.

General Electric Company.

(b) Volute pumps. - De Laval Mixed Flow Pumps Class MF.

Serial Numbers 229683
229684
229685

(c) Storage batteries. - Instructions for installing and operating exide batteries - low gravity types in rubber.

The Electric Storage Battery Company,
Philadelphia, Pennsylvania.

10-03. OPERATION. - a. The following quotations from the regulations govern the operation of pumping stations:

"Competent operators shall be on duty at pumping plants whenever it appears that necessity for pump operation is imminent. The operator shall thoroughly inspect, trial operate, and place in readiness all plant equipment. The operator shall be familiar with the equipment manufacturer's instructions and drawings and with the "Operating Instructions" for each station. The equipment shall be operated in accordance with the above-mentioned "Operating Instructions" and care shall be exercised that proper lubrication is being supplied all equipment, and that no overheating, undue vibration or noise is occurring. Immediately upon final recession of flood waters, the pumping station shall be thoroughly cleaned, pump house sumps flushed, and equipment thoroughly inspected, oiled and greased. A record or log of pumping plant operation shall be kept for each station, a copy of which shall be furnished the District Engineer following each flood."

b. North Meadows Pumping Station. - (1) Electric distribution. - (a) The switchboard controls the distribution of electric energy throughout the pumping station. In order to energize any of the feeders leading from the switchboard the selector switch should be turned to the position marked "Generator No. 1" or "Generator No. 2," whichever generator is to be used to energize the switchboard. Then, with the generator running at full rated speed the circuit breaker connecting the generator to the selector switch may be closed.

(b) The voltage on each of the three phases should now be read and the voltage set to 230 volts. The voltage regulators for the generators are mounted within the switchboard and are automatic when properly adjusted. The voltage regulator operates upon changes of generator voltage and varies the resistance in the exciter shunt field circuit, thus holding the voltage of the generator constant.

The large Exciter Field Rheostat on the switchboard has been set at the proper position for the operation of the voltage regulator and should be kept in this position. The proper position of the Exciter Field Rheostat is indicated by a mark on the front of the switchboard.

Any adjustment of the generator voltage should always be made by the small knob on the switchboard marked "Voltage Adjusting Rheostat." This should be set so that the phase to phase voltage of the generator as indicated on the switchboard is 230 volts.

If the voltage regulator fails to operate properly and does not hold the generator voltage constant, then the following procedure may be used until the voltage regulator is repaired. Turn the Exciter Field Rheostat to the extreme "Lower" position; turn the Voltage Adjusting Rheostat to the extreme "Raise" position; then turn the Exciter Field Rheostat until the voltage of the generator is 230 volts. The voltage regulator is now out of operation and the generator voltage must be controlled manually by the Exciter Field Rheostat. Each time the load on the generator is changed the operator must readjust the Exciter Field Rheostat to hold the generator voltage at 230 volts.

(c) Battery charger. - A Tungar rectifier is provided in the switchboard to charge the engine storage batteries. To

operate the charger close both the Input and Output battery charger circuit breakers and set the adjusting rheostat so that whatever charge is desired is indicated on the ammeter on the switchboard in the battery charging circuit.

(d) Water pump feeders. - The water pumps in the pump room are started by closing the individual circuit breakers on the switchboard feeding the pumps.

(2) Gasoline-electric generator units. - The following steps should be followed in starting either of the generator units:

(a) Check cooling water system to make sure engines are properly filled with cooling water.

(b) Check oil level.

(c) Pump up gasoline with hand pump.

(d) Close both ignition switches.

(e) Set throttle about one-half inch open from fully closed position.

(f) Press "Start" button and choke as much as necessary to start. During starting operations hold low oil pressure cutout switch closed.

(g) Do not choke any more than necessary to maintain engine firing evenly as overchoking results in the washing of oil from the cylinder walls and the dilution of crankcase oil with gasoline.

(h) Set throttle at an engine speed of 600 R.P.M. and allow engine to warm up for five minutes at this speed.

(i) Push throttle fully open. Governor will then maintain engine speed at 1200 R.P.M., regardless of load.

(j) Turn on battery charger and adjust to a charging rate of approximately ten amperes.

(3) Water pumps. - The water pumps are started from the switchboard as described in (1) (c) above. A gate valve has been provided on the intake and on the discharge of each pump. The valves on a pump not in use should be kept closed as otherwise water from the pump in use would circulate through the pump not in use.

(4) Electrically driven 16-inch pump. - Before starting the 16-inch pump the operator should make sure that the pump is primed. This may be ascertained by opening the gate valve on top of the discharge section of the pump. If the pump is primed water will flow out of this valve. If the pump is not primed the opening of this valve will allow all air in the pump to escape provided there is a head of water on the pump. When all air has been expelled from the pump and

water flows from this valve, the valve may be closed and pump operation begun.

The stuffing box on the pump should be adjusted so that a small trickle of water leaks through all the time the pump is in operation. If the pump has been dry for a long period of time the stuffing box will leak considerably when the pump is first filled with water. However, since the packing expands when wet, care should be exercised when starting the pump after a long inoperative period to see that the stuffing box packing does not swell sufficiently to bind the pump shaft.

The grease cups on the pump and steady bearing should be turned down a bit after every few hours of operation. Only a little grease should be fed to these bearings as too much grease is injurious to anti-friction bearings.

The pump should never be operated for more than fifteen seconds without water in it as the wearing rings in the pump are built with very close tolerances and depend on water for lubrication.

(5) 36-inch volute pumps. - The following steps should be followed in starting a 36-inch volute pump:

(a) Start a generator unit and one water pump to have a supply of cooling water available for the engine.

(b) Turn on water for engine cooling.

(c) Turn on water for engine exhaust cooling - make sure that drain from engine exhaust is turned off.

(d) Check oil level.

(e) Pump up gasoline with hand gasoline pump.

(f) Close both ignition switches.

(g) Set throttle approximately one-half inch from fully closed position.

(h) Press starter button and choke as much as necessary to start engine. Hold low oil pressure switch closed with one hand during starting operations.

(i) Do not choke any more than necessary to maintain engine firing evenly as overchoking results in the washing of oil from the cylinder walls and the dilution of crankcase oil with gasoline.

(j) Set throttle at an engine speed of 600 R.P.M. and allow engine to warm up for five minutes at this speed.

(k) Inspect operation of gear unit and check oil pressure.

(l) Check operation of pump and open test gate valve in discharge to make sure pump is primed.

(m) After five minute interval throttle on engine may be opened fully; governor will maintain engine speed at 1200 R.P.M.

(n) Turn on battery charger and adjust battery charger to rate of ten amperes for each engine in operation.

(o) An operator should maintain a close watch over the pump engines while in operation to make sure that the water supply does not fail. If the water supply fails due to a faulty pump or defective electrical control, the water in the cooling water system and in the upper parts of the engine will drain back through the pump. As the water temperature ignition cutout is located on the upper part of the cooling system it will not operate to stop the engine if no water is present to operate it.

(6) Sluice gates. - The hydraulically operated sluice gates are operated as follows:

(a) If gates on intake to conduit are to be moved check to see if mechanical lock on gate is unlocked. If gates on river end of conduit are to be moved check to see that gates are not latched in open position with dogging device. If it is found necessary to close the outside gates at a time when the height of the river prevents the unlatching of the gates, the oil pressure may be applied to the gates while still latched. A shear pin is provided in each latching device and can be sheared by the oil pressure. These pins, when replaced, must be replaced with the properly designed shear pins of the same shearing strength as recommended by the manufacturer.

(b) Start a gasoline-electric generator unit and energize feeder to sluice gate oil pump from switchboard.

(c) Turn the four-way valve on line to gates to be moved to position desired - either "Open" or "Close".

(d) Open gate valve in supply line from oil pump to this four-way valve.

(e) Start oil pump by pressing "Start" button on starter.

(f) The gates will now be raised or lowered by the oil pump.

(g) The maximum travel of the gates will have been reached when the pressure gauge on the oil pump discharge suddenly shows a higher pressure than when operating normally. At this point a relief valve allows the discharge of the oil pump to return directly to the oil tank.

(h) When maximum positions of gates have been reached stop oil pump.

(i) Shut gate valve in supply line from oil pump to four-way valve. The four-way valves are built to withstand full rated pressure but cannot be depended on for a dead-tight shut-off.

c. Keeney Lane and Bushnell Park Pumping Stations. - A water supply from the municipal water supply is furnished to each of these pumping stations and electricity is furnished by the local utility. The pumping equipment is identical with that in the North Meadows Pumping Station so that, except for the use of auxiliaries, to furnish water and electricity, the operation of the pumping equipment is similar to that for the North Meadows Pumping Station.

SECTION XI

DRAWINGS AND SPECIFICATIONS

11-01. DRAWINGS AND SPECIFICATIONS. - Complete sets of contract plans and specifications were given the City of Hartford when the various projects were completed and turned over to the city for maintenance and operation. A tabulation of these projects and the dates of transfer and acceptance is given below:

Item	Project	Turned Over	Accepted
HT 1 to 4	North Meadows Dike & Pumping Station	June 25, 1941	June 27, 1941
HT 5-7b	Riverfront Dike	Nov. 29, 1943	Dec. 6, 1943
HT 6	Park River Conduit	Nov. 29, 1943	Dec. 6, 1943
HT 7a	Dike Station 97+05 to Aviation Road	July 13, 1940	July 15, 1940
HT 8	Clark Dike	Oct. 25, 1939	Nov. 2, 1939
HT 9 & 10	Keeney Lane and Bushnell Park Pumping Stations (Temp.)	Aug. 4, 1944	Aug. 11, 1944
		Aug. 4, 1944	Aug. 11, 1944
	Gully Brook Conduit	Aug. 25, 1944	Aug. 28, 1944

APPENDIX "A"

TITLE 33—NAVIGATION AND NAVIGABLE WATERS

Chapter II—Corps of Engineers, War Department

PART 208—FLOOD CONTROL REGULATIONS

MAINTENANCE AND OPERATION OF FLOOD CONTROL WORKS

Pursuant to the provisions of section 3 of the Act of Congress approved June 22, 1936, as amended and supplemented (49 Stat. 1571; 50 Stat. 877; and 55 Stat. 638; 33 U. S. C. 701c; 701c–1), the following regulations are hereby prescribed to govern the maintenance and operation of flood control works:

§ 208.10 *Local flood protection works; maintenance and operation of structures and facilities*—(a) *General.* (1) The structures and facilities constructed by the United States for local flood protection shall be continuously maintained in such a manner and operated at such times and for such periods as may be necessary to obtain the maximum benefits.

(2) The State, political subdivision thereof, or other responsible local agency, which furnished assurance that it will maintain and operate flood control works in accordance with regulations prescribed by the Secretary of War, as required by law, shall appoint a permanent committee consisting of or headed by an official hereinafter called the "Superintendent," who shall be responsible for the development and maintenance of, and directly in charge of, an organization responsible for the efficient operation and maintenance of all of the structures and facilities during flood periods and for continuous inspection and maintenance of the project works during periods of low water, all without cost to the United States.

(3) A reserve supply of materials needed during a flood emergency shall be kept on hand at all times.

(4) No encroachment or trespass which will adversely affect the efficient operation or maintenance of the project works shall be permitted upon the rights-of-way for the protective facilities.

(5) No improvement shall be passed over, under, or through the walls, levees, improved channels or floodways, nor shall any excavation or construction be permitted within the limits of the project right-of-way, nor shall any change be made in any feature of the works without prior determination by the District Engineer of the War Department or his authorized representative that such improvement, excavation, construction, or alteration will not adversely affect the functioning of the protective facilities. Such improvements or alterations as may be found to be desirable and permissible under the above determination shall be constructed in accordance with standard engineering practice. Advice regarding the effect of proposed improvements or alterations on the functioning of the project and information concerning methods of construction acceptable under standard engineering practice shall be obtained from the District Engineer or, if otherwise obtained, shall be submitted for his approval. Drawings or prints showing such improvements or alterations as finally constructed shall be furnished the District Engineer after completion of the work.

(6) It shall be the duty of the superintendent to submit a semiannual report to the District Engineer covering inspection, maintenance, and operation of the protective works.

(7) The District Engineer or his authorized representatives shall have access at all times to all portions of the protective works.

(8) Maintenance measures or repairs which the District Engineer deems necessary shall be promptly taken or made.

(9) Appropriate measures shall be taken by local authorities to insure that the activities of all local organizations operating public or private facilities connected with the protective works are coordinated with those of the Superintendent's organization during flood periods.

(10) The War Department will furnish local interests with an Operation and Maintenance Manual for each completed project, or separate useful part thereof, to assist them in carrying out their obligations under these regulations.

(b) *Levees*—(1) *Maintenance.* The Superintendent shall provide at all times such maintenance as may be required to insure serviceability of the structures in time of flood. Measures shall be taken to promote the growth of sod, exterminate burrowing animals, and to provide for routine mowing of the grass and weeds, removal of wild growth and drift deposits, and repair of damage caused by erosion or other forces. Where practicable, measures shall be taken to retard bank erosion by planting of willows or other suitable growth on areas riverward of the levees. Periodic inspections shall be made by the Superintendent to insure that the above maintenance measures are being effectively carried out and, further, to be certain that:

(i) No unusual settlement, sloughing, or material loss of grade or levee cross section has taken place;

(ii) No caving has occurred on either the land side or the river side of the levee which might affect the stability of the levee section;

(iii) No seepage, saturated areas, or sand boils are occurring;

(iv) Toe drainage systems and pressure relief wells are in good working condition, and that such facilities are not becoming clogged;

(v) Drains through the levees and gates on said drains are in good working condition;

(vi) No revetment work or riprap has been displaced, washed out, or removed;

(vii) No action is being taken; such as burning grass and weeds during inappropriate seasons, which will retard or destroy the growth of sod;

(viii) Access roads to and on the levee are being properly maintained;

(ix) Cattle guards and gates are in good condition;

(x) Crown of levee is shaped so as to drain readily, and roadway thereon, if any, is well shaped and maintained;

(xi) There is no unauthorized grazing or vehicular traffic on the levees;

(xii) Encroachments are not being made on the levee right-of-way which might endanger the structure or hinder its proper and efficient functioning durin times of emergency.

Such inspections shall be made immediately prior to the beginning of the flood season; immediately following each major high water period, and otherwise at intervals not exceeding 90 days; and such intermediate times as may be necessary to insure the best possible care of the levee. Immediate steps will be taken to correct dangerous conditions disclosed by such inspections. Regular maintenance repair measures shall be accomplished during the appropriate season as scheduled by the Superintendent.

(2) *Operation.* During flood periods the levee shall be patrolled continuously to locate possible sand boils or unusual wetness of the landward slope and to be certain that:

(i) There are no indications of slides or sloughs developing;

(ii) Wave wash or scouring action is not occurring;

(iii) No low reaches of levee exist which may be overtopped;

(iv) No other conditions exist which might endanger the structure.

Appropriate advance measures will be taken to insure the availability of adequate labor and materials to meet all contingencies. Immediate steps will be taken to control any condition which endangers the levee and to repair the damaged section.

(c) *Flood walls.*—(1) *Maintenance.* Periodic inspections shall be made by the Superintendent to be certain that:

(i) No seepage, saturated areas, or sand boils are occurring;

(ii) No undue settlement has occurred which affects the stability of the wall or its water tightness;

(iii) No trees exist, the roots of which might extend under the wall and offer accelerated seepage paths;

(iv) The concrete has not undergone cracking, chipping, or breaking to an extent which might affect the stability of the wall or its water tightness;

(v) There are no encroachments upon the right-of-way which might endanger the structure or hinder its functioning in time of flood;

(vi) Care is being exercised to prevent accumulation of trash and debris adjacent to walls, and to insure that no fires are being built near them;

(vii) No bank caving conditions exist riverward of the wall which might endanger its stability;

(viii) Toe drainage systems and pressure relief wells are in good working condition, and that such facilities are not becoming clogged.

Such inspections shall be made immediately prior to the beginning of the flood season, immediately following each major high water period, and otherwise at intervals not exceeding 90 days. Measures to eliminate encroachments and effect repairs found necessary by such inspections shall be undertaken immediately. All repairs shall be accomplished by methods acceptable in standard engineering practice.

(2) *Operation.* Continuous patrol of the wall shall be maintained during flood periods to locate possible leakage at monolith joints or seepage underneath the wall. Floating plant or boats will not be allowed to lie against or tie up to the wall. Should it become necessary during a flood emergency to pass anchor cables over the wall, adequate measures shall be taken to protect the concrete and construction joints. Immediate steps shall be taken to correct any condition which endangers the stability of the wall.

(d) *Drainage structures*—(1) *Maintenance.* Adequate measures shall be taken to insure that inlet and outlet channels are kept open and that trash, drift, or debris is not allowed to accumulate near drainage structures. Flap gates and manually operated gates and valves on

drainage structures shall be examined, oiled, and trial operated at least once every 90 days. Where drainage structures are provided with stop log or other emergency closures, the condition of the equipment and its housing shall be inspected regularly and a trial installation of the emergency closure shall be made at least once each year. Periodic inspections shall be made by the Superintendent to be certain that:

(i) Pipes, gates, operating mechanism, riprap, and headwalls are in good condition;

(ii) Inlet and outlet channels are open;

(iii) Care is being exercised to prevent the accumulation of trash and debris near the structures and that no fires are being built near bituminous coated pipes;

(iv) Erosion is not occurring adjacent to the structure which might endanger its water tightness or stability.

Immediate steps will be taken to repair damage, replace missing or broken parts, or remedy adverse conditions disclosed by such inspections.

(2) *Operation.* Whenever high water conditions impend, all gates will be inspected a short time before water reaches the invert of the pipe and any object which might prevent closure of the gate shall be removed. Automatic gates shall be closely observed until it has been ascertained that they are securely closed. Manually operated gates and valves shall be closed as necessary to prevent inflow of flood water. All drainage structures in levees shall be inspected frequently during floods to ascertain whether seepage is taking place along the lines of their contact with the embankment. Immediate steps shall be taken to correct any adverse condition.

(e) *Closure structures*—(1) *Maintenance.* Closure structures for traffic openings shall be inspected by the superintendent every 90 days to be certain that:

(i) No parts are missing;

(ii) Metal parts are adequately covered with paint;

(iii) All movable parts are in satisfactory working order,

(iv) Proper closure can be made promptly when necessary;

(v) Sufficient materials are on hand for the erection of sand bag closures and that the location of such materials will be readily accessible in times of emergency.

Tools and parts shall not be removed for other use. Trial erections of one or more closure structures shall be made once each year, alternating the structures chosen so that each gate will be erected at least once in each 3-year period. Trial erection of all closure structures shall be made whenever a change is made in key operating personnel. Where railroad operation makes trial erection of a closure structure infeasible, rigorous inspection and drill of operating personnel may be substituted therefor. Trial erection of sand bag closures is not required. Closure materials will be carefully checked prior to and following flood periods, and damaged or missing parts shall be repaired or replaced immediately.

(2) *Operation.* Erection of each movable closure shall be started in sufficient time to permit completion before flood waters reach the top of the structure sill. Information regarding the proper method of erecting each individual closure structure, together with an estimate of the time required by an experienced crew to complete its erection will be given in the Operation and Maintenance Manual which will be furnished local interests upon completion of the project. Closure structures will be inspected frequently during flood periods to ascertain that no undue leakage is occurring and that drains provided to care for ordinary leakage are functioning properly. Boats or floating plant shall not be allowed to tie up to closure structures or to discharge passengers or cargo over them.

(f) *Pumping plants*—(1) *Maintenance.* Pumping plants shall be inspected by the Superintendent at intervals not to exceed 30 days during flood seasons and 90 days during off-flood seasons to insure that all equipment is in order for instant use. At regular intervals, proper measures shall be taken to provide for cleaning plant, buildings, and equipment, repainting as necessary, and lubricating all machinery Adequate supplies of lubricants for all types of machines, fuel for gasoline or diesel powered equipment, and flash lights or lanterns for emergency lighting shall be kept on hand at all times. Telephone service shall be maintained at pumping plants. All equipment, including switch gear, transformers, motors, pumps, valves, and gates shall be trial operated and checked at least once every 90 days. Megger tests of all insulation shall be made whenever wiring has been subjected to undue dampness and otherwise at intervals not to exceed one year. A record shall be kept showing the results of such tests. Wiring disclosed to be in an unsatisfactory condition by such tests shall be brought to a satisfactory condition or shall be promptly replaced. Diesel and gasoline engines shall be started at such intervals and allowed to run for such length of time as may be necessary to insure their serviceability in times of emergency. Only skilled electricians and mechanics shall be employed on tests and repairs. Operating personnel for the plant shall be present during tests. Any equipment removed from the station for repair or replacement shall be returned or replaced as soon as practicable and shall be trial operated after reinstallation. Repairs requiring removal of equipment from the plant shall be made during off-flood seasons insofar as practicable.

(2) *Operation.* Competent operators shall be on duty at pumping plants whenever it appears that necessity for pump operation is imminent. The operator shall thoroughly inspect, trial operate, and place in readiness all plant equipment. The operator shall be familiar with the equipment manufacturers' instructions and drawings and with the "Operating Instructions" for each station. The equipment shall be operated in accordance with the above-mentioned "Operating Instructions" and care shall be exercised that proper lubrication is being supplied all equipment, and that no overheating, undue vibration or noise is occurring. Immediately upon final recession of flood waters, the pumping station shall be thoroughly cleaned, pump house sumps flushed, and equipment thoroughly inspected, oiled and greased. A record or log of pumping plant operation shall be kept for each station, a copy of which shall be furnished the District Engineer following each flood.

(g) *Channels and floodways* — (1) *Maintenance.* Periodic inspections of improved channels and floodways shall be made by the Superintendent to be certain that:

(i) The channel or floodway is clear of debris, weeds, and wild growth;

(ii) The channel or floodway is not being restricted by the depositing of waste materials, building of unauthorized structures or other encroachments;

(iii) The capacity of the channel or floodway is not being reduced by the formation of shoals;

(iv) Banks are not being damaged by rain or wave wash, and that no sloughing of banks has occurred;

(v) Riprap sections and deflection dikes and walls are in good condition;

(vi) Approach and egress channels adjacent to the improved channel or floodway are sufficiently clear of obstructions and debris to permit proper functioning of the project works.

Such inspections shall be made prior to the beginning of the flood season and otherwise at intervals not to exceed 90 days. Immediate steps will be taken to remedy any adverse conditions disclosed by such inspections. Measures will be taken by the Superintendent to promote the growth of grass on bank slopes and earth deflection dikes. The Superintendent shall provide for periodic repair and cleaning of debris basins, check dams, and related structures as may be necessary.

(2) *Operation.* Both banks of the channel shall be patrolled during periods of high water, and measures shall be taken to protect those reaches being attacked by the current or by wave wash. Appropriate measures shall be taken to prevent the formation of jams of ice or debris. Large objects which become lodged against the bank shall be removed. The improved channel or floodway shall be thoroughly inspected immediately following each major high water period. As soon as practicable thereafter, all snags and other debris shall be removed and all damage to banks, riprap, deflection dikes and walls, drainage outlets, or other flood control structures repaired.

(h) *Miscellaneous facilities* — (1) *Maintenance.* Miscellaneous structures and facilities constructed as a part of the protective works and other structures and facilities which function as a part of, or affect the efficient functioning of the protective works, shall be periodically inspected by the Superintendent and appropriate maintenance measures taken. Damaged or unserviceable parts shall be repaired or replaced without delay. Areas used for ponding in connection with pumping plants or for temporary storage of interior run-off during flood periods shall not be allowed to become filled with silt, debris, or dumped material. The Superintendent shall take proper steps to prevent restriction of bridge openings and, where practicable, shall provide for temporary raising during floods of bridges which restrict channel capacities during high flows.

(2) *Operation.* Miscellaneous facilities shall be operated to prevent or reduce flooding during periods of high water. Those facilities constructed as a part of the protective works shall not be used for purposes other than flood protection without approval of the District Engineer unless designed therefor. (49 Stat. 1571, 50 Stat. 877; and 55 Stat. 638; 33 U.S.C. 701c; 701c-1) (Regs. 9 August 1944, CE SPEWF)

[SEAL] J. A. ULIO,
Major General,
The Adjutant General.

[F. R. Doc. 44-12285; Filed, August 16, 1944; 9:44 a. m.]

APPENDIX "B"

ASSURANCE OF LOCAL COOPERATION	SECTION
Clark Dike and North Meadows Dike	A
Riverfront Dike	B
Park River Conduit	C
Gully Brook Conduit	D

SECTION A

:U.S.ENGINEER OFFICE:
: PROVIDENCE,R.I. :
: SEP 17 1936 :
: FC 14/10 :

OFFICE OF THE TOWN AND CITY CLERK

HARTFORD, CONNECTICUT

JOHN A. GLEASON
Town and City Clerk
WILLIAM L. FARRELL
First Deputy
MARGARET A. CARROLL
Second Deputy

September 15, 1936.

This certifies that at a meeting of the Court of Common Council held September 14, 1936, the following RESOLUTIONS were passed, under suspension of rules by unamimous rising vote, and were approved by His Honor, the Mayor, September 15, 1936.

RESOLVED, That the City of Hartford accept the offer of the United States Government to expend $250,000 for the enlargement and raising of the existing dikes at Hartford to the approximate elevation of the March 1936 flood, upon the terms and with the assurances requested in the letter of Lieutenant Colonel Mason J. Young, District Engineer for the United States War Department Engineer Office at Providence, R. I., dated August 26, 1936, and addressed to the Honorable Thomas J. Spellacy, Mayor of Hartford, said sum to be expended upon the work of raising Clark Dike to the elevation of approximately 38.5 feet, City datum, and thereafter so far as available to the raising of the Colt Dike or part of the same to approximately the same level if, without expense to the City, the necessary easements can be acquired; and be it further,

RESOLVED, That the City Engineer and the Executive Secretary of the Flood Investigation and Improvement Commission be and they are hereby authorized by and on behalf of the City of Hartford to enter into such agreements with the United States as it may request as evidence of the City's formal acceptance of the $250,000 allotment for the work in question, to comply with the rules and regulations of the War Department or the Flood Control Act; and be it further,

RESOLVED, That in the absence or inability of either to act, His Honor, the Mayor, be and he is hereby authorized to enter into any such contract on behalf of the City of Hartford.

Attest;

/s/ John A. Gleason

City Clerk.

ASSURANCES BY THE CITY OF HARTFORD, CONNECTICUT

WHEREAS, pursuant to the provisions of the Emergency Relief Appropriation Act of 1936, approved June 22, 1936, making an appropriation for flood control and other conservation, andallotment of funds has been approved by the President, August 12, 1936, for raising and enlarging existing dikes in the Connecticut River for the flood protection of the City of Hartford; and

WHEREAS, the United States of America, through the Corps of Engineers of the War Department, having jurisdiction of construction of said flood control project, and in accordance with the policy of the federal government that no money shall be expended on the construction of any project until States, political sub-divisions thereof, or other responsible local agencies have given assurances satisfactory to the Secretary of War that they will (a) provide without cost to the United States all lands, easements, and rights-of-way necessary for the construction of the project, except as otherwise provided herein; (b) hold and save the United States free from damages due to the construction works; (c) maintain and operate all the works after completion in accordance with regulations prescribed by the Secretary of War; and

WHEREAS, the Court of Common Council of the City of Hartford by virtue of the authority vested in it under Charter of The City of Hartford has duly passed a Resolution at a meeting held on September 14, 1936, authorizing the City of Hartford to accept the offer of the United States of America to construct certain works of improvement for flood protection of the City of Hartford, Connecticut, has authorized the City Engineer and the Executive Secretary of the Flood Investigation and Improvement Commission

to enter into such agreements with the United States as it may request as evidence of the City's formal acceptance.

NOW, THEREFORE, in order to comply with the established policy of the federal government pertaining to the construction of flood control projects, and in consideration of the construction by the United States, and of the benefits to accrue from the work of improvement, The City of Hartford hereby assures the Secretary of War as follows:

(a) That the City of Hartford will furnish, without cost to the United States, all lands, easements and rights-of-way, necessary for the raising and enlarging existing dikes along the Connecticut River for flood protection of the City of Hartford, in accordance with a resolution of the Court of Common Council of the City of Hartford dated September 14, 1936. The lands, easements and rights-of-way which the City of Hartford shall furnish shall include those needed for raising and enlarging dikes, for borrow pits and spoil disposal areas, for access roads, and all other rights in, upon, through or over private property which are required by the United States in connection with the construction of the project. Maps showing the lands, easements, or rights-of-way needed in the prosecution of the work will be obtained by the City of Hartford for the United States. Detailed property surveys and title searches necessary to acquire the land or interests therein will be performed by the City of Hartford.

(b) That the City of Hartford will hold and save the United States, its officers and employees, free from all claims for damages and from all liability due to the construction works; it being understood that the City of Hartford will hold and save the United States, its officers and employees free from all claims for property damage to land, buildings or any

rights therein acquired for or affected by the construction of the work.

(c) That the City of Hartford will maintain and operate without expense to the United States all of the works after completion, in accordance with regulations prescribed by the Secretary of War.

(d) That it is understood by the City of Hartford that the United States is not committed or obligated in any way to complete said flood control work or any part thereof.

IN WITNESS WHEREOF, We, Roscoe N. Clark, City Engineer, and Charles J. Bennett, Executive Secretary of the Flood Investigation and Improvement Commission, under authority of the Court of Common Council of The City of Hartford, have hereunto set our hands and caused the common seal of The City of Hartford to be affixed hereto this 22nd day of September, A.D. 1936.

ATTEST:

Vincent W. Dennis
William A. Linmane

THE CITY OF HARTFORD,

By Roscoe N. Clark
City Engineer.

Charles J. Bennett
Executive Secretary of the Flood Investigation and Improvement Commission

Recommended as satisfactory assurances

EDWARD M. MARKHAM
Major General, Chief of Engineers
United States Army

Accepted as satisfactory assurances

Secretary of War

STATE OF CONNECTICUT)
(SS.
COUNTY OF HARTFORD)

On this 22nd day of September in the year one thousand nine hundred and thirty-six, before me personnaly came Roscoe N. Clark and Charles J. Bennett, to me known, who being by me duly sworn, did depose and say that they reside in Hartford, Connecticut; that they are City Engineer and Executive Secretary of the Flood Investigation and Improvement Commission, respectively, of The City of Hartford, Connecticut, described in and who executed the foregoing instrument; that they know the common seal of The City of Hartford, that the seal affixed to said instrument is such City seal; that it was so affixed by authority of law of said City and that they signed their names thereto by like authority.

My commission expires

Vincent W. Dennis

Commissioner of Superior Court

File:	FC 14
No.	

Substitute the following paragraph for Subparagraph (b), Page 2 of assurances:

(b) That the City of Hartford will save harmless and protect the United States of America, its officers and agents, from any and all claims for damages, and from all liabilities, but excluding any claim, or claims, of an employee, contractor or subcontractor, servant, agent, or officer of the United States for personal injuries received in connection with said improvement work, and excluding any claim, or claims, of a person or persons for injuries or damages suffered by reason of the negligence of any employee, contractor or subcontractor, servant, agent, or officer of the United States engaged in said project.

(Substitution taken over telephone from Div. Office)

:----------:
:U.S. ENGINEER OFFICE:
:PROVIDENCE, R.I. :
:FEB 16 1938 :
:F.C. 14/15-1 :
:----------:

OFFICE OF THE TOWN AND CITY CLERK

JOHN A. GLEASON
TOWN AND CITY CLERK

Hartford, Connecticut

WILLIAM L. FARRELL
FIRST DEPUTY

MARGARET A. CARROLL
SECOND DEPUTY

February 15, 1938.

This certifies that at a meeting of the Court of Common Council held February 14, 1938, the following RESOLUTIONS were passed, and were approved by His Honor, the Mayor, February 15, 1938.

RESOLVED, That the City of Hartford accept the offer of the United States Government to expend funds under the Emergency Relief Appropriation Act approved June 29, 1937 for raising and enlarging the existing earth dyke along the Connecticut River in South Meadows, Hartford, Connecticut, in accordance with a plan prepared by the District Engineer, U. S. Engineer Office, Providence, Rhode Island.

RESOLVED, That the City Engineer and the Executive Secretary of the Flood Commission of the City of Hartford, be and are hereby authorized, by and on behalf of the City of Hartford to enter into such agreement with the United States as it may require to comply with the requirements of the Emergency Relief Appropriation Act approved June 29, 1937, and the rules and regulations of the War Department relating to Flood Control projects; and be it further,

RESOLVED, That in the absence or inability of either to act, His Honor, the Mayor, be and he is hereby authorized to enter into any such contract on behalf of the City of Hartford.

Attest:

* SEAL OF THE CITY OF HARTFORD, CONNECTICUT *

/s/ John A. Gleason

City Clerk.

ASSURANCES BY THE CITY OF HARTFORD, CONNECTICUT

WHEREAS, Pursuant to the provisions of the Emergency Relief Appropriation Act approved June 29, 1937, the President has approved an allotment of funds for raising and enlarging the existing earth dike along the Connecticut River in the South Meadows at Hartford, Connecticut, said work to be undertaken by the Corps of Engineers of the War Department having jurisdiction of the construction of floodcontrol projects; and

WHEREAS, Said Emergency Relief Appropriation Act approved June 29, 1937, provides, among other things, that no non-Federal project shall be undertaken or prosecuted with funds appropriated by said Act unless and until the sponsor has made a written agreement to finance such part of the entire cost thereof as is not to be supplied from Federal funds; and

WHEREAS, The Court of Common Council of the City of Hartford by virtue of the authority vested in it under Charter of the City of Hartford has duly passed a Resulution at a meeting held on February 14, 1938, authorizing the City of Hartford to accept the offer of the United States of America to construct certain works of improvement for flood protection of the City of Hartford, Connecticut, has authorized the City Engineer and the Executive Secretary of the Flood Commission of The City of Hartford to enter into such agreements as it may request as evidence of the City's formal acceptance.

NOW, THEREFORE, in order to comply with the established policy of the federal government pertaining to the construction

of flood control projects, and in consideration of the construction by the United States, the City of Hartford hereby agrees:-

(a) That the City of Hartford will furnish without cost to the United States, all lands, easements and rights-of-way necessary to the project.

(b) That the City of Hartford will hold and save the United States, its officers and employees, free from all claims for damages and from all liability due to construction works; it being understood that the City of Hartford will hold and save the United States, its officers and employees free from all claims for property damage to land, buildings or rights-of-way therein acquired for or affected by the construction of the work.

(c) That the City of Hartford will maintain and operate without expense to the United States all of the works after completion, in accordance with regulations prescribed by the Secretary of War.

(d) That City of Hartford hereby irrevocably agrees to finance such part of the entire cost of said project or an integral part of said project which will afford protection to people and city property as is not to be supplied from Federal funds.

IN WITNESS WHEREOF, We, Robert J. Ross, City Engineer, and Charles J. Bennett, Executive Secretary of the Flood Commission of The City of Hartford, have hereunto set our hands and caused the common seal of the City of Hartford to be affixed hereto this 19th day of February, A.D. 1938.

ATTEST: THE CITY OF HARTFORD

by /s/ Robert J. Ross
City Engineer

/s/ Charles J. Bennett
Executive Secretary of the Flood
Commission of the City of Hartford

Subscribed and sworn to before me
this 19th day of February, 1938

/s/ Porter H. Barrows
Notary Public

COPY

OFFICE OF THE TOWN AND CITY CLERK

Hartford, Connecticut

:U.S. ENGINEER OFFICE:
:PROVIDENCE, R.I. :
:F.C. 14/25-8 :
:NOV 21, 1938 :

November 15, 1938.

This certifies that at a meeting of the Court of Common Council held November 14, 1938, the following RESOLUTIONS were passed under suspension of rules by rising vote of 18 to 0, and were approved by His Honor, the Mayor, November 15, 1938.

RESOLVED: That the City of Hartford accept the offer of the United States Government to expend funds under the Emergency Relief Appropriation Act approved June 21, 1938, for the construction of flood protective works for the City of Hartford; and further

RESOLVED: That the City Engineer and the Executive Secretary of the Flood Commission of the City of Hartford be and they are hereby authorized by and on behalf of the City of Hartford to enter into such agreement with the United States as it may require to comply with the requirements of the Flood Control Act approved by Congress June 22, 1936 and modified by the Act approved by Congress June 28, 1938, and with the Emergency Relief Appropriation Act approved June 21, 1938, and the Rules and Regulations of the War Department relating to flood control projects; and further

RESOLVED: That in the absence or inability of either to act, His Honor the Mayor be and he hereby is authorized to enter into any such contract on behalf of the City of Hartford.

Attest: (Signed) JOHN A. GLEASON

City Clerk

ASSURANCES BY THE CITY OF HARTFORD, CONNECTICUT

- - - -

WHEREAS, by Section 3 of the Flood Control Act approved June 22, 1936, known as the Flood Control Act of 1936, no money appropriated under authority of said act shall be expended on the construction of any project until states, political subdivisions thereof, or other responsible local agencies have given assurances to the Secretary of War that they will (a) provide without cost to the United States, all lands, easements, and rights-of-way necessary for the construction of the project; (b) hold and save the United States free from damages due to the construction works; (c) maintain and operate all the works after completion in accordance with regulations prescribed by the Secretary of War; and

WHEREAS, by the Flood Control Act approved June 28, 1938, local flood protection works were authorized to be constructed at Hartford, Connecticut River Basin, Connecticut, which said works are subject to the provisions of Section 3 of the Flood Control Act of 1936; and

WHEREAS, an allotment of funds has been made for the prosecution of said works;

NOW, THEREFORE, to comply with the requirements of Section 3 of the Flood Control Act of 1936, THE CITY OF HARTFORD pursuant to a resolution made and approved by the Court of Common Council at a meeting held on November 14, 1938 does hereby assure the Secretary of War that it will comply with the above stated provisions of Section 3 of the Flood Control Act of 1936 in connection with the works shown on the plans bearing file mark, CT-4-1090 which are on file in the United States Engineer Office, Providence, Rhode Island. In accordance with the established policy of the Corps of Engineers the CITY OF HARTFORD will furnish necessary borrow pits with rights of entry thereto.

IN WITNESS WHEREOF, we, Robert J. Ross, City Engineer of the City of Hartford, and Charles J. Bennett, Executive Secretary of the Flood Commission of the City of Hartford, have hereunto set our hands and caused the common seal of the City of Hartford to be affixed hereto this 18 day of November, 1938.

CITY OF HARTFORD

By /s/ Robert J. Ross
City Engineer

By /s/ Charles J. Bennett
Executive Secretary of the Flood Commission of the City of Hartford

STATE OF CONNECTICUT :
: ss. Hartford, November 18, 1938.
COUNTY OF HARTFORD :

Personnally appeared Robert J. Ross, City Engineer of the City of Hartford and Charles J. Bennett, Executive Secretary of the Flood Commission of the City of Hartford, signers and sealers of the foregoing instrument and acknowledged the same to be the free act and deed of the City of Hartford and their free act and deed as City Engineer of the City of Hartford and Executive Secretary of the Flood Commission of the City of Hartford, respectively, before me

/s/ Ann C. Toccaline
Notary Public.

SECTION B

ASSURANCES BY THE CITY OF HARTFORD, CONNECTICUT

WHEREAS, by Section 3 of the Flood Control Act approved June 22, 1936, known as the Flood Control Act of 1936, no money appropriated under authority of said act shall be expended on the construction of any project until states, political subdivision thereof, or other responsible local agencies have given assurances to the Secretary of War that they will,

(a) Provide without cost to the United States, all lands, easements, and rights-of-way necessary for the construction of the project.

(b) Hold and save the United States free from damages due to the construction works.

(c) Maintain and operate all the works after completion in accordance with regulations prescribed by the Secretary of War

WHEREAS, by the Flood Control Act approved June 28, 1938, local flood protection works were authorized to be constructed in the Connecticut River Basin for the protection of the City of Hartford, Connecticut, which said works are subject to the provisions of Section 3 of the Flood Control Act of 1936; and

WHEREAS, an allotment of funds has been made for the prosecution of said works,

NOW, THEREFORE, to comply with the requirements of Section 3 of the Flood Control Act of 1936, the City of Hartford, Connecticut, pursuant to resolutions made and approved by the Court of Common Council of the City of Hartford at a meeting held on November 14, 1938, and likewise at a meeting held March 27, 1940, and a further meeting of the Flood Commission held March 13, 1940, does hereby assure the Secretary of War that

Commission held March 13, 1940, does hereby assure the Secretary of War that it will comply with the above stated provisions of Section 3 of the Flood Control Act of 1936 in connection with the proposed dike project extending along the Connecticut River from Morgan Street southerly to Station 96+73 as shown on plans on file in the United States Engineer Office at Providence, Rhode Island, and known as dike Item HT. 5-7b. In accordance with the established policy of the Corps of Engineers, the City of Hartford will furnish necessary borrow pits with rights of entry thereto.

IN WITNESS WHEREOF, we, Robert J. Ross, City Engineer of the City of Hartford, and Charles J. Bennett, Executive Secretary of the Flood Commission of the City of Hartford, have hereunto set our hands and caused the common seal of the City of Hartford to be affixed hereto this 3d day of May, 1940.

CITY OF HARTFORD

by /s/ Robert J. Ross
City Engineer.

by /s/ Charles J. Bennett
Executive Secretary of the Flood
Commission of the City of Hartford.

STATE OF CONNECTICUT)
) SS. May 31, 1940
COUNTY OF HARTFORD)

Personally appeared Robert J. Ross, City Engineer of the City of Hartford, signer and sealer of the foregoing instrument and acknowledged same to be the free act and deed of the City of Hartford and his free act and deed as City Engineer of the City of Hartford, before me

/s/ Porter H. Barrows
Notary Public

My Commission Expires February 1, 1941

STATE OF CONNECTICUT)
) SS. May 31, 1940
COUNTY OF HARTFORD)

Personally appeared Charles J. Bennett, Executive Secretary of the Flood Commission of the City of Hartford, signer and sealer of the foregoing instrument and acknowledged same to be the free act and deed of the City of Hartford and his free act and deed as Executive Secretary of the Flood Commission of the City of Hartford, before me

/s/ Dagmar L. Christensen
Notary Public

My Commission Expires February 1, 1941

OFFICE OF THE TOWN AND CITY CLERK

HARTFORD, CONNECTICUT

March 28, 1940.

JOHN A. GLEASON
Town and City Clerk
WILLIAM L. FARRELL
First Deputy
MARGARET A. CARROLL
Second Deputy

This certifies that at a meeting of the Court of Common Council held March 27, 1940, the following RESOLUTIONS were passed, under suspension of rules by unanimous rising vote of 19 to 0, and were approved by His Honor, the Mayor, March 28, 1940.

RESOLVED, That the Flood Commission of the City of Hartford be and it is hereby authorized by and on behalf of the City of Hartford to request that the flood control prevention from Memorial Bridge to a point seven hundred feet (700.0 ft.) south of the mouth of the Park River be raised to elevations as shown on plans entitled "Connecticut River Crest Profile (Estimated) for Flood Flow of 360,000 c.f.s. with Dykes in Hartford and East Hartford", made for the Hartford Flood Commission by the Department of Engineering, City of Hartford. Scales as noted June 1938, revised August 10, 1939; and further

RESOLVED, That said Flood Commission be and it is hereby authorized by and on behalf of the City of Hartford to request such other modifications and additions to the flood control work authorized by the Flood Control Act approved by Congress June 22, 1936, and modified by the Act approved by Congress June 28, 1938, and the rules and regulations of the War Department relating to flood control projects, as in its judgment shall be come necessary; and further

RESOLVED, That said Flood Commission be and it is hereby authorized to assure the Secretary of War that the excess cost of design and construction resulting from the compliance with such requests will be borne by the City of Hartford.

Attest:

/s/ John A. Gleason

City Clerk.

OFFICE OF THE TOWN AND CITY CLERK

HARTFORD, CONNECTICUT

March 28, 1940.

JOHN A. GLEASON
Town and City Clerk
WILLIAM L. FARRELL
First Deputy
MARGARET A. CARROLL
Second Deputy

This certifies that at a meeting of the Court of Common Council held March 27, 1940, the following RESOLUTION was passed, under suspension of rules by unanimous rising vote of 19 to 0, and was approved by His Honor, the Mayor, March 28, 1940.

RESOLVED, That the Flood Commission of the City of Hartford be and it is hereby authorized to advance to the United States of America or to any Department of the United States of America out of funds appropriated to it for flood protective works such sum or sums not exceeding the unexpended total of the amount so appropriated as may be required by any Act of Congress or by the rules and regulations of the War Department relating to flood control projects.

Attest:

/s/ John A. Gleason

City Clerk.

SECTION C

ASSURANCES BY THE CITY OF HARTFORD, CONNECTICUT

WHEREAS, by Section 3 of the Flood Control Act approved June 22, 1936, known as the Flood Control Act of 1936, no money appropriated under authority of said act shall be expended on the construction of any project until states, political subdivision thereof, or other responsible local agencies have given assurances to the Secretary of War that they will,

(a) Provide without cost to the United States, all lands, easements, and rights-of-way necessary for the construction of the project,

(b) Hold and save the United States free from damages due to the construction works,

(c) Maintain and operate all the works after completion in accordance with regulations prescribed by the Secretary of War,

WHEREAS, by the Flood Control Act approved June 28, 1938, local flood protection works were authorized to be constructed in the Connecticut River Basin for the protection of the City of Hartford, Connecticut, which said works are subject to the provisions of Section 3 of the Flood Control Act of 1936; and

WHEREAS, an allotment of funds has been made for the prosecution of said works,

NOW, THEREFORE, to comply with the requirements of Section 3 of the Flood Control Act of 1936, the City of Hartford, Connecticut, pursuant to resolutions made and approved by the Court of Common Council of the City of Hartford at a meeting held on November 14, 1938, and likewise at a meeting held March 27, 1940, and a further meeting of the Flood

it will comply with the above stated provisions of Section 3 of the Flood Control Act of 1936 in connection with the proposed Park River conduit extending westerly from the Connecticut River to about station 65+24, as shown on plans on file in the U.S. Engineer Office in Providence, Rhode Island and entitled "Connecticut River Flood Control Project, Park River Conduit, Hartford, Connecticut -- Plans for the Construction of Conduit and Appurtenant Structures - Item HT 6-Contract, War Department, Corps of Engineers, U. S. Army, U. S. Engineer Office, Providence, R. I., 1940". In accordance with the established policy of the Corps of Engineers, the City of Hartford will furnish necessary borrow pits with rights of entry thereto.

IN WITNESS WHEREOF, we, Robert J. Ross, City Engineer of the City of Hartford, and Charles J. Bennett, Executive Secretary of the Flood Commission of the City of Hartford, have hereunto set our hands and caused the common seal of the City of Hartford to be affixed hereto this 9th day of July, 1940.

CITY OF HARTFORD

by /s/ Robert J. Ross
City Engineer

by /s/ Charles J. Bennett
Executive Secretary of the Flood
Commission of the City of Hartford.

STATE OF CONNECTICUT)
) ss.
COUNTY OF HARTFORD)

Personally appeared Robert J. Ross, City Engineer of the City of Hartford, signer and sealer of the foregoing instrument and acknowledged same to be the free act and deed of the City of Hartford and his free act and deed as City Engineer of the City of Hartford, before me

/s/ Porter H. Barrows
Notary Public

My Commission Expires February 1, 1941

STATE OF CONNECTICUT)
) ss.
COUNTY OF HARTFORD)

Personally appeared Charles J. Bennett, Executive Secretary of the Flood Commission of the City of Hartford, signer and sealer of the foregoing instrument and acknowledged same to be the free act and deed of the City of Hartford and his free act and deed as Executive Secretary of the Flood Commission of the City of Hartford, before me

/s/ H. Leon Vietts
Notary Public

My Commission Expires February 1, 1943

Flood Commission of The City of Hartford

36 Pearl Street

HARTFORD, CONNECTICUT

March 28, 1940

Chief of Engineers
c/o J. S. Bragdon
Lieut. Col. Corps of Engineers
United States Engineer Office
Providence, Rhode Island

Sir:

The City of Hartford hereby requests that you design and construct the Park River Conduit in accordance with layout and plan submitted in report of Metcalf and Eddy to the District Engineer, dated February 23d, 1940.

The City of Hartford hereby assures you and the Secretary of War that the excess cost of design and construction resulting from compliance with the request will be borne by the City, and a formal offer to contribute the amount thereof will be made as soon as the same has been determined.

The authority of the signers to bind the City is contained in a resolution adopted by the Flood Commission of the City of Hartford at a meeting held on March 13th, 1940 and by the Court of Common Council at a meeting held the 27th day of March 1940, certified copies of which are hereto attached.

CITY OF HARTFORD

by /s/ Robert J. Ross
City Engineer

by /s/ Charles J. Bennett
Executive Secretary of the Flood
Commission of the City of Hartford

STATE OF CONNECTICUT)
) SS Hartford, March 28, 1940
COUNTY OF HARTFORD)

Personally appeared ROBERT J. ROSS, City Engineer of the City of Hartford, signer and sealer of the foregoing instrument, and acknowledged the same to be his free act and deed as City Engineer of the City of Hartford.

/s/ Porter H. Barrows
Notary Public

STATE OF CONNECTICUT)
) SS Hartford, March 28, 1940
COUNTY OF HARTFORD)

Personally appeared CHARLES J. BENNETT, Executive Secretary of the Flood Commission of the City of Hartford, signer and sealer of the foregoing instrument, and acknowledged same to be his free act and deed as Executive Secretary of the Flood Commission of the City of Hartford.

/s/ H. Leon Vietts
Notary Public

March 29th, 1940

This certifies that at a meeting of the Flood Commission of the City of Hartford held on March 13th, 1940, it was -

VOTED that following the passage by the Common Council of the above resolution (namely, resolution of the Court of Common Council passed on March 27th, 1940) that the City Engineer and the Executive Secretary of the Flood Commission, or in their absence or inability to act, the Mayor be authorized to make formal requests and provide assurances to meet the rules and requirements of the War Department.

Attest: /s/ Charles J. Bennett
Executive Secretary of the Flood
Commission of the City of Hartford

SECTION D

June 29, 1943

WHEREAS, the project for Flood Control in the Connecticut River Basin adopted by Act of Congress June 28, 1938 and by Act of Congress August 18, 1941 is to be modified by Act of Congress approved October 26, 1942 to include and authorize the construction of the Gully Brook Conduit at Hartford, Connecticut; and

WHEREAS, under the terms of said Flood Control Acts the City of Hartford is required to furnish the assurances hereinafter set forth to the Secretary of War; and

WHEREAS, the Court of Common Council of the City of Hartford, by virtue of the authority vested in it under the charter of the City of Hartford duly passed a resolution at a meeting held on June 23, 1943 authorizing the Chairman of the Flood Commission of the City of Hartford and the City Engineer of the City of Hartford to give said assurances to the Secretary of War;

NOW THEREFORE, the City of Hartford, pursuant to said resolution, does hereby assure the Secretary of War that it will:

(a) Provide without cost to the United States all lands, easements, and rights-of-way necessary for construction of the project.

(b) Bear the expense of all necessary utility alterations including sewers, and complete the closure section of Gully Brook conduit extension across Park River.

(c) Hold and save the United States free from claims for damages resulting from construction of the works.

(d) Maintain and operate all works upon completion in accordance with regulations prescribed by the Secretary of War.

IN WITNESS WHEREOF, we, William H. Putnam, Chairman of the Flood Commission of the City of Hartford, and Robert J. Ross, City Engineer of the City of Hartford, have hereunto set our hands and caused the common seal of the City of Hartford to be affixed hereto this 29th day of June, 1943.

CITY OF HARTFORD

By /s/ William H. Putnam
Chairman of the Flood Commission

By /s/ Robert J. Ross
City Engineer

STATE OF CONNECTICUT)
) ss: Hartford, June 29, 1943
COUNTY OF HARTFORD)

Personally appeared William H. Putnam, Chairman of the Flood Commission of the City of Hartford, and Robert J. Ross, City Engineer of the City of Hartford, signers and sealers of the foregoing instrument, and acknowledged the same to be the free act and deed of the City of Hartford and their free act and deed as Chairman of the Flood Commission of the City of Hartford and City Engineer of the City of Hartford, respectively, before me,

/s/ Marion P. Coffill

Notary Public

APPENDIX "C"

INSPECTION REPORT
FOR
FLOOD PROTECTION SYSTEM, HARTFORD, CONN.

Dike Inspection Report (Part 1) Date _____

	Location (from Sta. to Sta.)	Description
a. Grass or sod:		
b. Damage due to fire:		
c. Rain, wave, current wash or caving banks:		
d. Damage due to rodents:		
e. Damage due to livestock:		
f. Sand boil areas marked:		

INSPECTION REPORT
FOR
FLOOD PROTECTION SYSTEM, HARTFORD, CONN.

Dike Inspection Report (Part 2) Date _____

	Location (from Sta. to Sta.)	Description
g. Trespassing on right-of-way:		
h. Damage to toe drains:		
i. Damage to riprap:		
j. Damage to dike crown:		

Check items if found satisfactory.

If everything is not in order, explain below:

_____

_____

_____

_____

Inspected by: _____

INSPECTION REPORT
FOR
FLOOD PROTECTION SYSTEM, HARTFORD, CONN.

Concrete Wall Inspection Report Date _____

a. Monolith joints

(1) Expansion material _____

(2) Concrete at joints _____

b. Wall

(1) Cracks _____

(2) Settlement _____

(3) Caving of banks _____

(4) Bank protection _____

(5) Toe drains _____

c. Trespassing on right-of-way

(1) Excavation _____

(2) Depositing materials _____

(3) Construction _____

(4) Fires _____

Check items if found satisfactory.

If everything is not in order, explain below:

_____

_____

_____

_____

Inspected by: _____

INSPECTION REPORT
FOR
FLOOD PROTECTION SYSTEM, HARTFORD, CONN.

Drainage Structure Inspection Report Date _____

	Location	Condition
a. Valves or Gates:		
b. Pipe:		
c. Headwalls:		
d. Riprap:		
e. Catch Basins:		
f. Stone Gutters:		

Check items if found satisfactory.

If everything is not in order, explain below:

Inspected by: _____

INSPECTION REPORT
FOR
FLOOD PROTECTION SYSTEM, HARTFORD, CONN.

Closure Structure Inspection Report Date _____

	Closures						
	Stoplog No. 1	Stoplog No. 2	Bulkhead Door	Stoplog No. 3	Stoplog No. 4	Stoplog No. 5	Stoplog No. 6
a. Concrete							
b. Metal Parts							
c. Timbers							
d. Repairs Needed							
e. Parts Needing Paint							
f. Date of Last Trial Erection							
g. Sand Bags Available							

Check items if found satisfactory.

If everything is not in order, explain below:

_____

_____

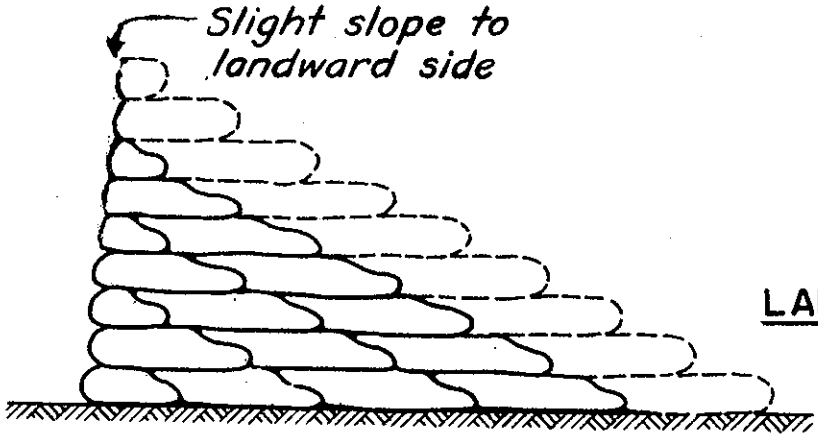
_____

_____

Inspected by: _____

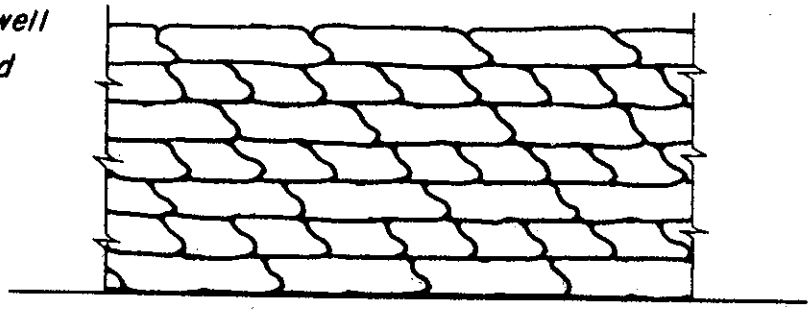
APPENDIX "D"

DRAWINGS



SECTION

Note: Sacks should be lapped at least 1/3 all ways and well mauled or tamped into place.



RIVERSIDE ELEVATION

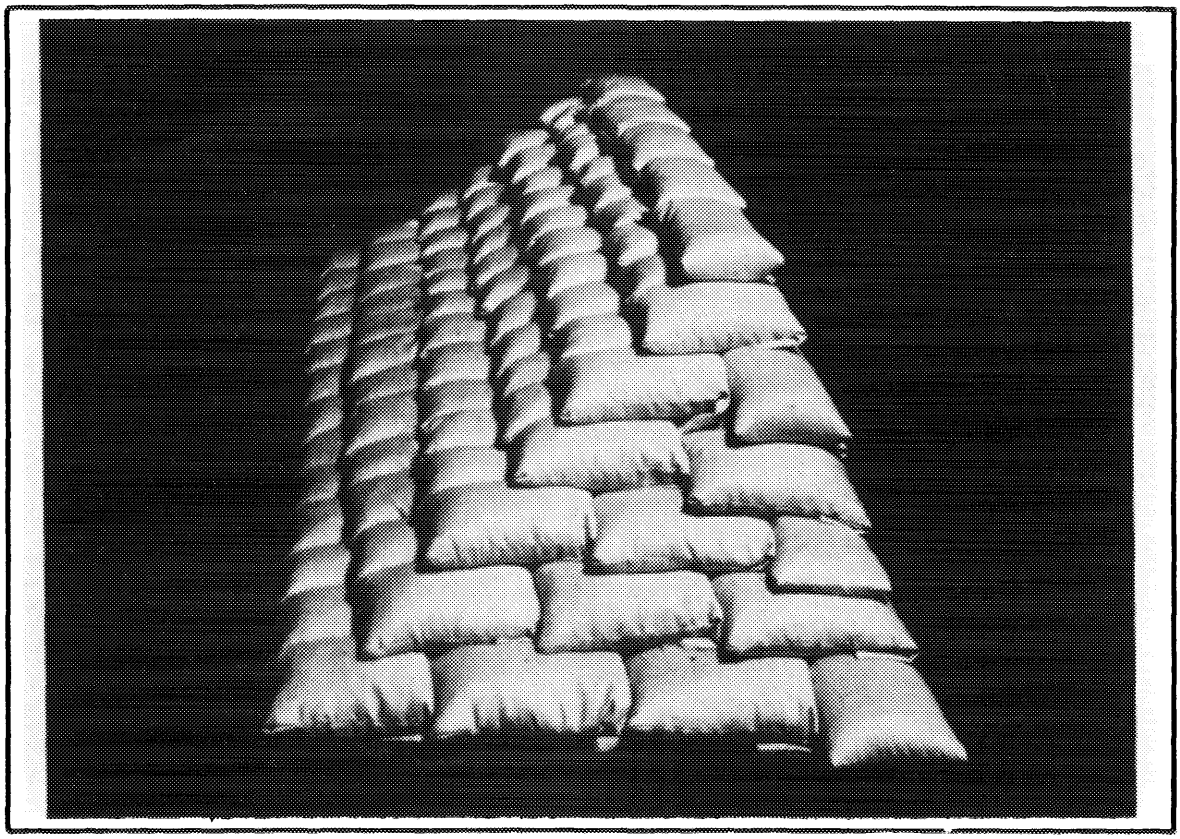
SACKS REQUIRED PER 100' STA.
100 lb. "Feed" Sacks - 1 Cu. Ft. Each

Approx. Hgt. Sack Dike	Sacks High	Required
1.5	3	300
2.0	4	750
3.0	6	1400
4.0	8	2250
5.0	10	3250
6.0	12	4500
7.0	14	5950
8.0	16	7600

SACK DIKE OR TOPPING
STANDARD HIGH WATER
MAINTENANCE INSTRUCTION

U. S. ENGINEER OFFICE, PROVIDENCE, R. I.

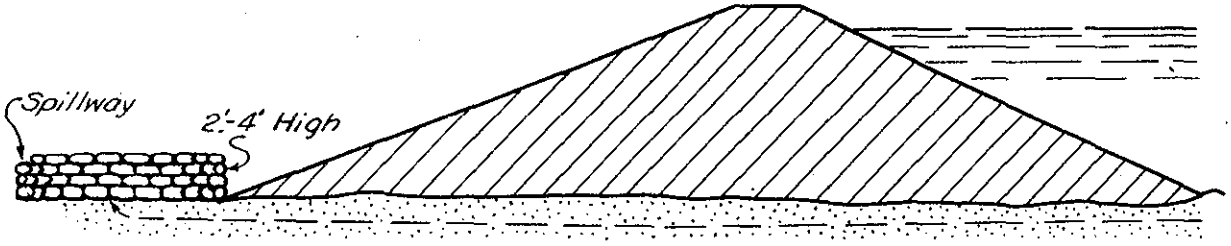
Plate I



MODEL SACK DIKE OR TOPPING
Typical Section

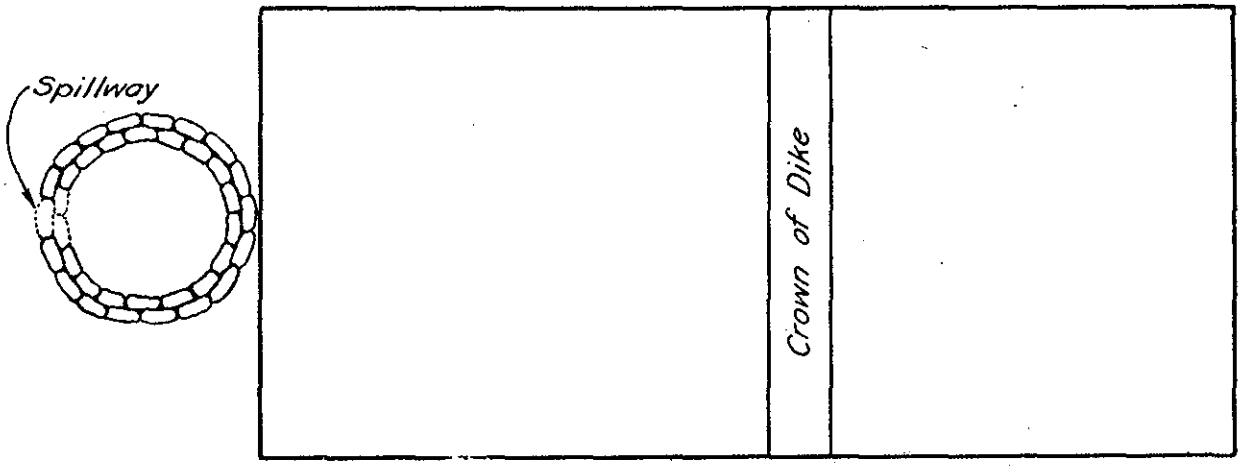
MODEL SACK DIKE OR TOPPING
Riverside View

PLATE IA



ELEVATION

Wall should be built on firm foundation, with width of base at least 1½ times the height.
Be sure to place sacks on ground clear of sand discharge.
Tie into dike if boil is near toe.



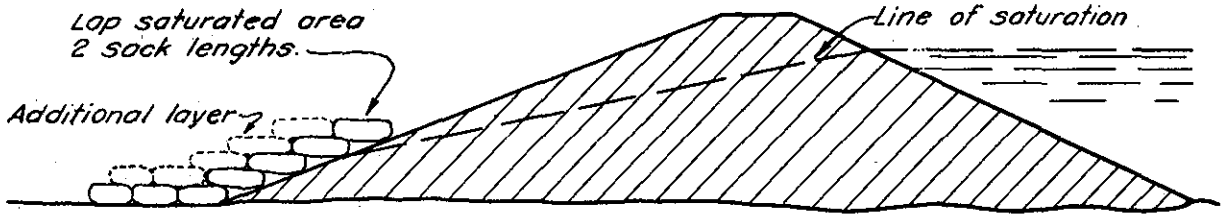
PLAN

Do not sack boil which does not put out material. Height of sack loop or ring should be only sufficient to create enough head to slow down flow through boil so that no more material is displaced and boil runs clear. Do not try to stop fully, flow through boil.

SAND BOIL
STANDARD HIGH WATER
MAINTENANCE INSTRUCTION

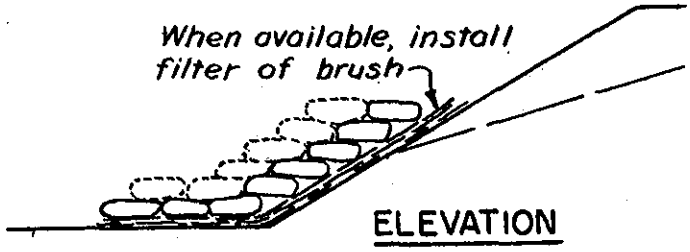
U. S. ENGINEER OFFICE, PROVIDENCE, R.I.

Plate II

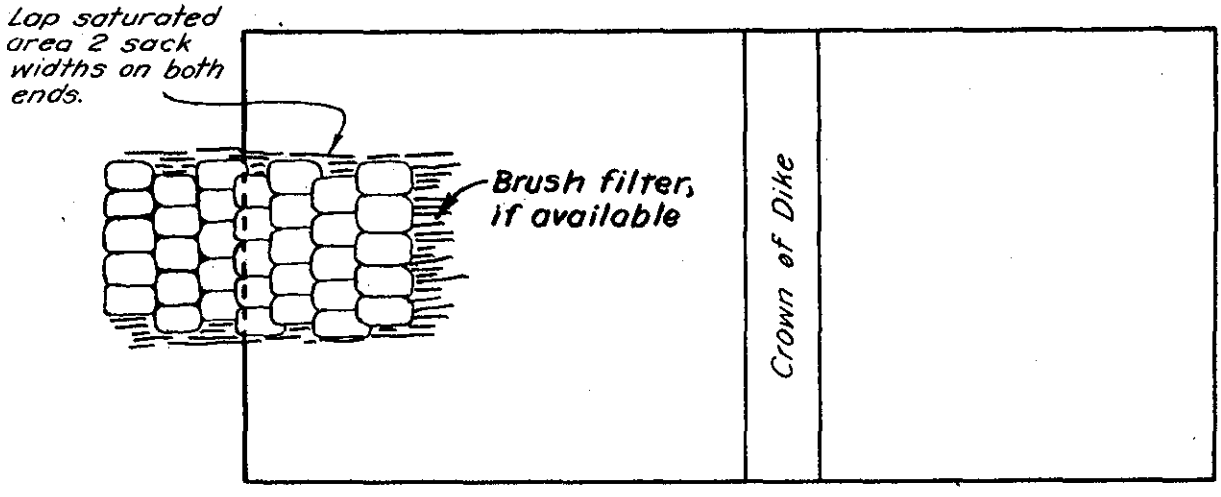


ELEVATION

Number of layers determined by velocity of seepage and amount of material being carried.



ELEVATION



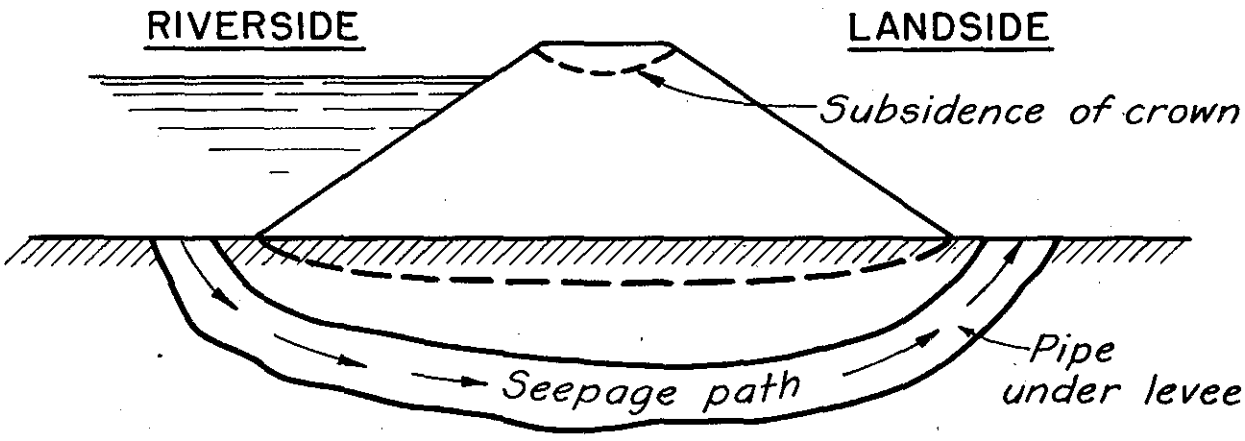
PLAN

Socks should be laid shingle fashion and not moulded into place.

SACKING SLOUGHS
STANDARD HIGH WATER
MAINTENANCE INSTRUCTION

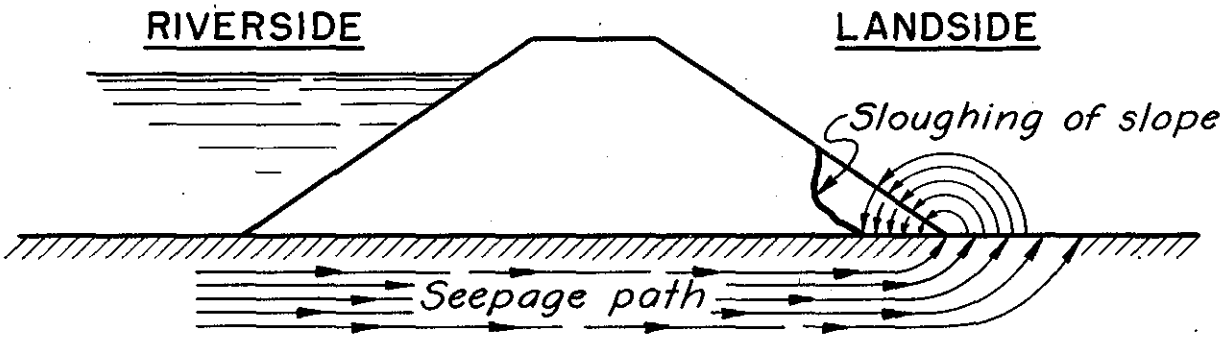
U.S. ENGINEER OFFICE, PROVIDENCE, R.I.

EFFECTS OF SAND BOILS ON LEVEE



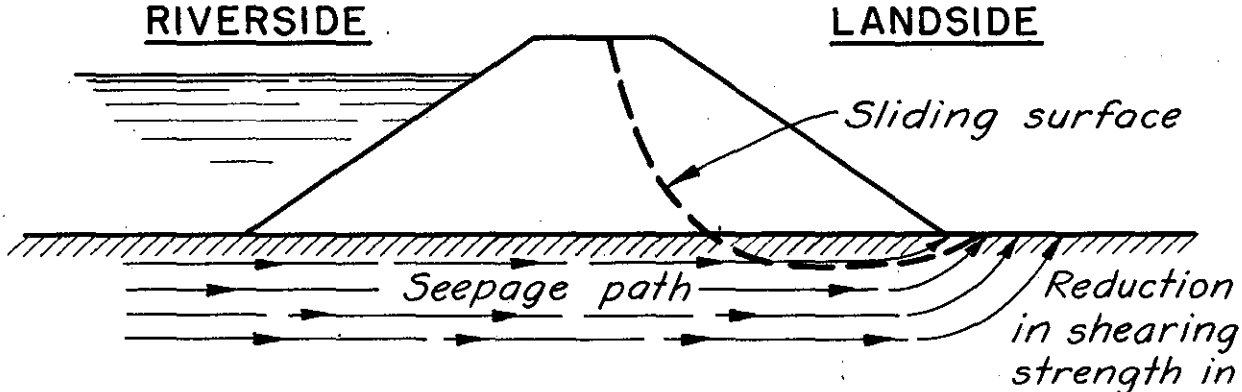
DEVELOPMENT OF PIPE UNDER LEVEE

Fig. 1



SLOUGHING OF LANDSLIDE SLOPE DUE TO RAVELLING AND UNDERCUTTING OF TOE

Fig. 2

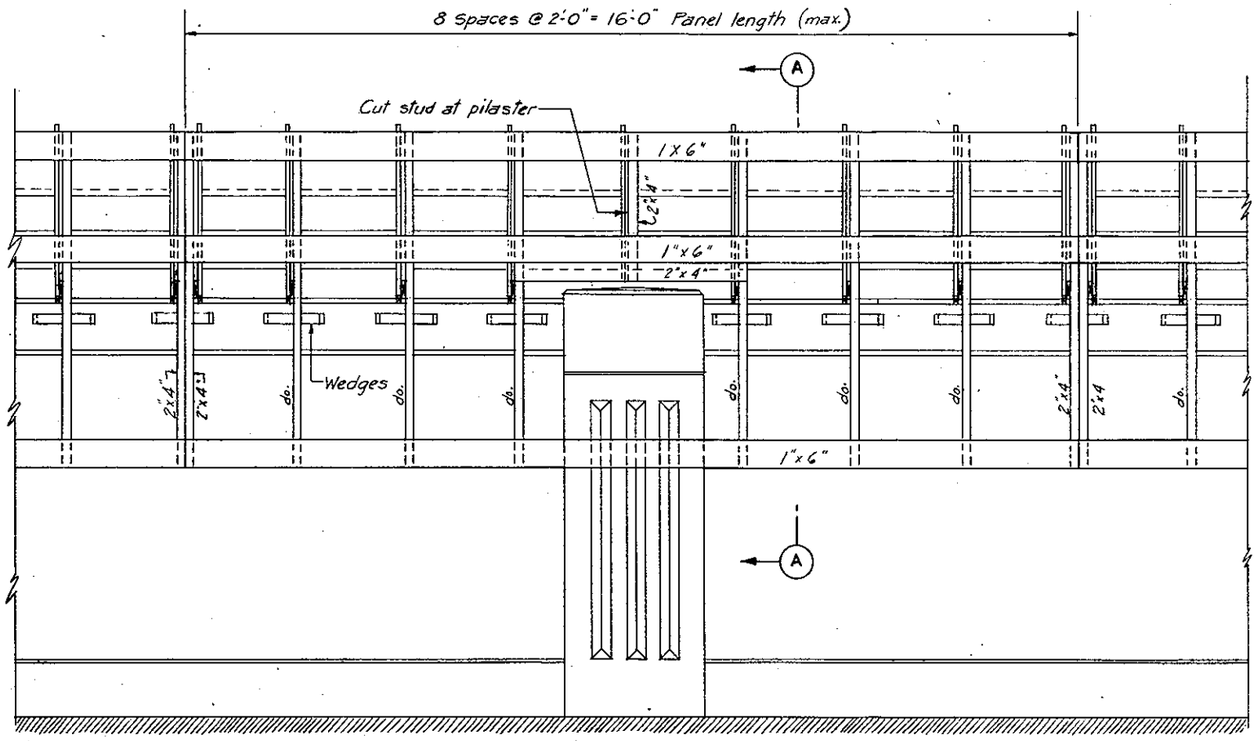


DEVELOPMENT OF SHEAR SLIDE

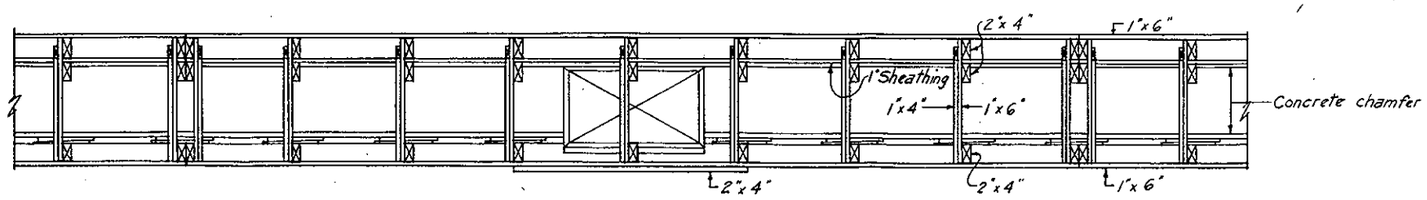
Fig. 3

PLATE III A

BILL OF MATERIALS		
For one 8'-0" panel. Regular wall section.		
Uprights	10 pcs.	2"x 4" x 6'-0"
Vert. brace	5 "	2"x4" x 3'-0"
Stringers	5 "	1"x 6"x 8'-0"
Upper ties	5 "	1"x 6"x 2'-3"
Lower ties	5 "	1"x 4" x 2'-3"
Diagonals	5 "	1"x 4" x 3'-6"
Sheathing	6"	1"x 6" x 8'-0" or random widths to make up 36"
Wedges	8	(½" to 1½")x2"x1'-0" = 1-3"x2"x4'-0"
For one 8'-0" panel. Pilaster section Same as above list except:		
Substitute one upright 2"x4"x2'-9" for one 2"x4"x6'-0"		
Add one stringer piece 2"x4"x 4'-2"		

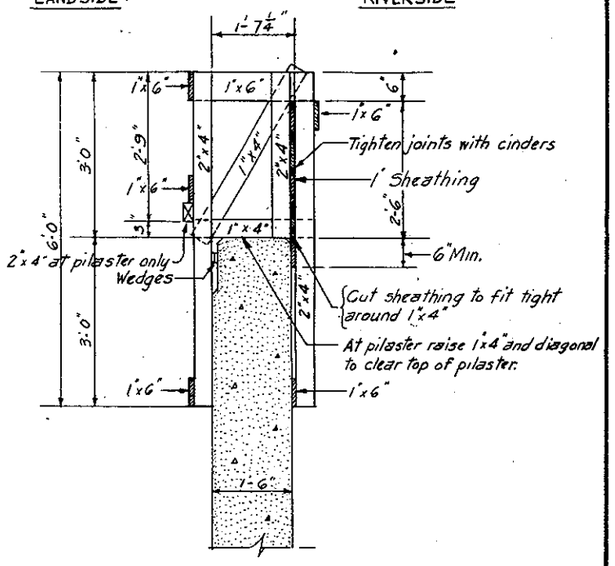


LANDSIDE ELEVATION

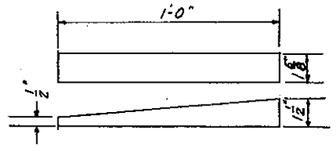


PLAN

LANDSIDE RIVERSIDE



SECTION A-A



WEDGE

KEY	DATE	REVISION (Indicated by △)	REV. BY	CK. BY	AP. BY

CONNECTICUT RIVER FLOOD CONTROL

EMERGENCY FLASH BOARDS FOR FLOOD WALLS

CONNECTICUT RIVER MASSACHUSETTS

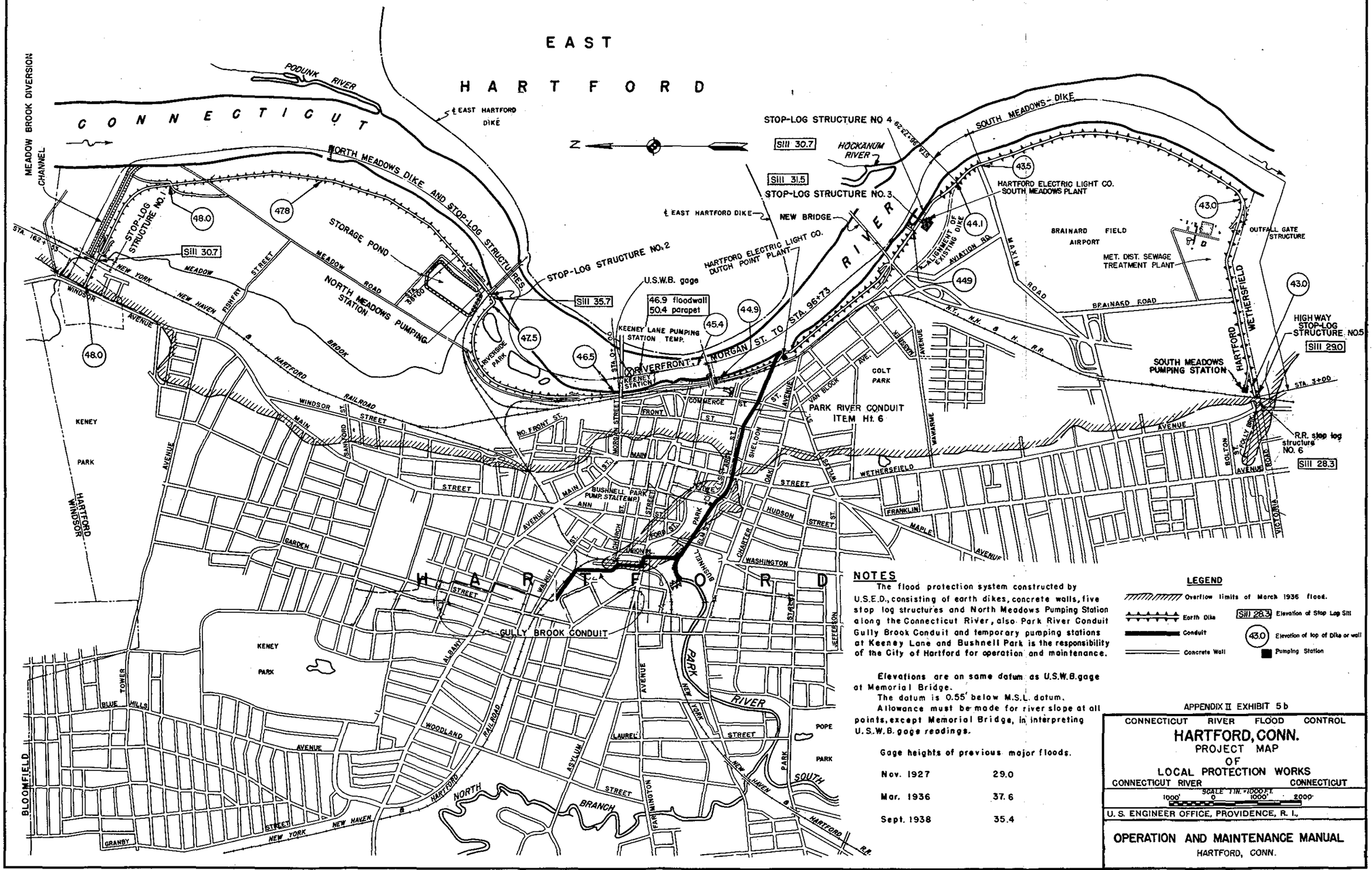
IN 1 SHEETS. SCALE: ¾ IN. = 1 FT. SHEET NO. 1

U.S. ENGINEER OFFICE, PROVIDENCE, R.I., FEB. 1945

SUBMITTED: E. W. Vines, SENIOR ENGINEER
APPROVAL RECOMMENDED: J. K. Burns, HEAD ENGINEER, CHIEF, ENGINEERING DIV.
APPROVED: W. J. Truss, COL., CORPS OF ENGINEERS, DISTRICT ENGINEER

PREPARED: E. J. Hayes, STRUCTURAL SECTION
DRAWN: E. J. H.
TRACED:
CHECKED:
FILE NO. CT-4-3408

PLATE IV



NOTES

The flood protection system constructed by U.S.E.D., consisting of earth dikes, concrete walls, five stop log structures and North Meadows Pumping Station along the Connecticut River, also Park River Conduit Gully Brook Conduit and temporary pumping stations at Keeney Lane and Bushnell Park is the responsibility of the City of Hartford for operation and maintenance.

Elevations are on same datum as U.S.W.B. gage at Memorial Bridge.

The datum is 0.55' below M.S.L. datum.

Allowance must be made for river slope at all points, except Memorial Bridge, in interpreting U.S.W.B. gage readings.

Gage heights of previous major floods.

Nov. 1927	29.0
Mar. 1936	37.6
Sept. 1938	35.4

LEGEND

- Overflow limits of March 1936 flood.
- Earth Dike
- Conduit
- Concrete Wall
- Sill 28.3 — Elevation of Stop Log Sill
- 43.0 — Elevation of top of Dike or wall
- Pumping Station

APPENDIX II EXHIBIT 5b

CONNECTICUT RIVER FLOOD CONTROL

HARTFORD, CONN.

PROJECT MAP

OF

LOCAL PROTECTION WORKS

CONNECTICUT RIVER CONNECTICUT

SCALE 1 IN. = 1000 FT.

1000' 0 1000' 2000'

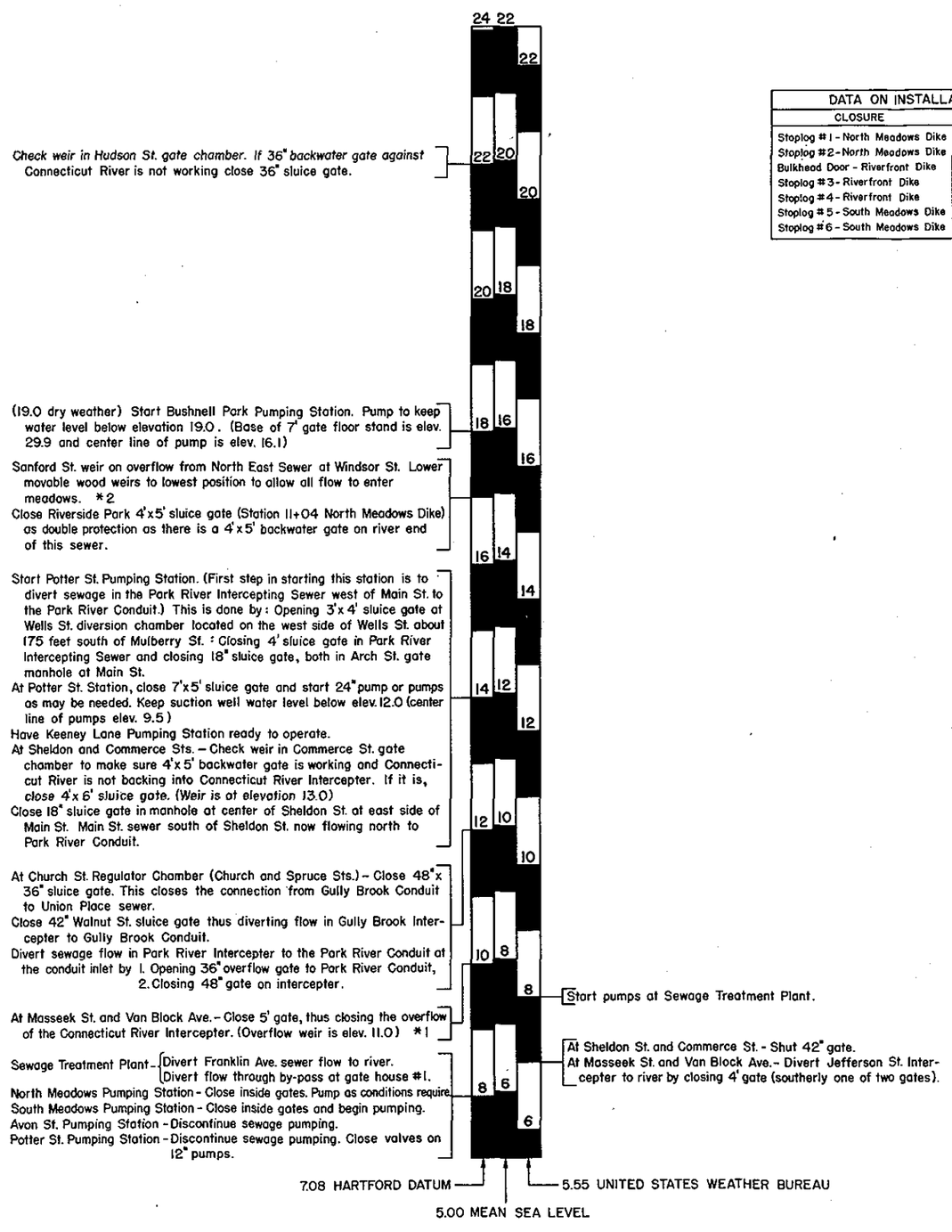
U. S. ENGINEER OFFICE, PROVIDENCE, R. I.,

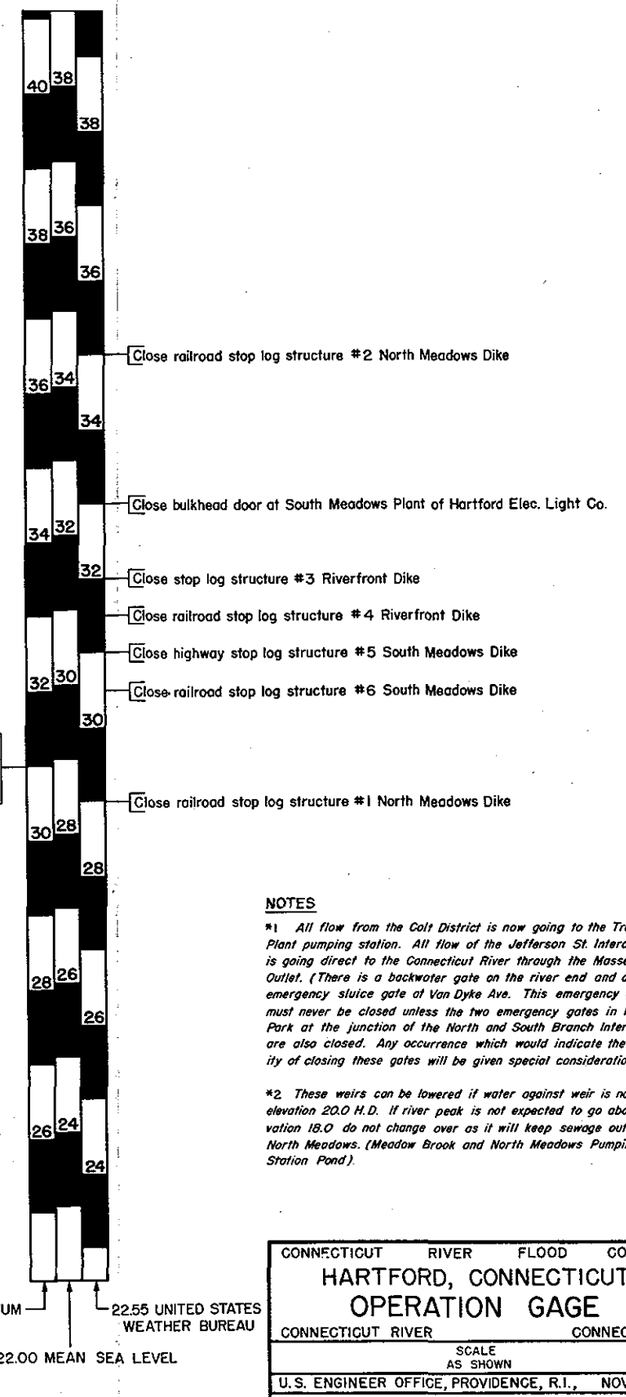
OPERATION AND MAINTENANCE MANUAL

HARTFORD, CONN.

PLATE V

DATA ON INSTALLATION OF STOPLOGS		
CLOSURE	SIZE OF CREW	TIME REQUIRED
Stoplog #1 - North Meadows Dike	15 men	4 hrs.
Stoplog #2 - North Meadows Dike	16 men	3 hrs.
Bulkhead Door - Riverfront Dike	1 man	½ hr.
Stoplog #3 - Riverfront Dike	4 men	2 hrs.
Stoplog #4 - Riverfront Dike	10 men	2½ hrs.
Stoplog #5 - South Meadows Dike	10 men	2½ hrs.
Stoplog #6 - South Meadows Dike	10 men	4 hrs.





NOTES

*1 *All flow from the Colt District is now going to the Treatment Plant pumping station. All flow of the Jefferson St. Intercepter is going direct to the Connecticut River through the Masseek St. Outlet. (There is a backwater gate on the river end and a 5 foot emergency sluice gate at Van Dyke Ave. This emergency gate must never be closed unless the two emergency gates in Pope Park at the junction of the North and South Branch Intercepters are also closed. Any occurrence which would indicate the necessity of closing these gates will be given speciol consideration.)*

*2 *These weirs can be lowered if water against weir is not above elevation 20.0 H.D. If river peak is not expected to go above elevation 18.0 do not change over as it will keep sewage out of the North Meadows. (Meadow Brook and North Meadows Pumping Station Pond).*

KEY	DATE	REVISION (Indicated by Δ)	REV BY	CK. BY	AP. BY

CONNECTICUT RIVER FLOOD CONTROL

HARTFORD, CONNECTICUT

OPERATION GAGE

CONNECTICUT RIVER CONNECTICUT

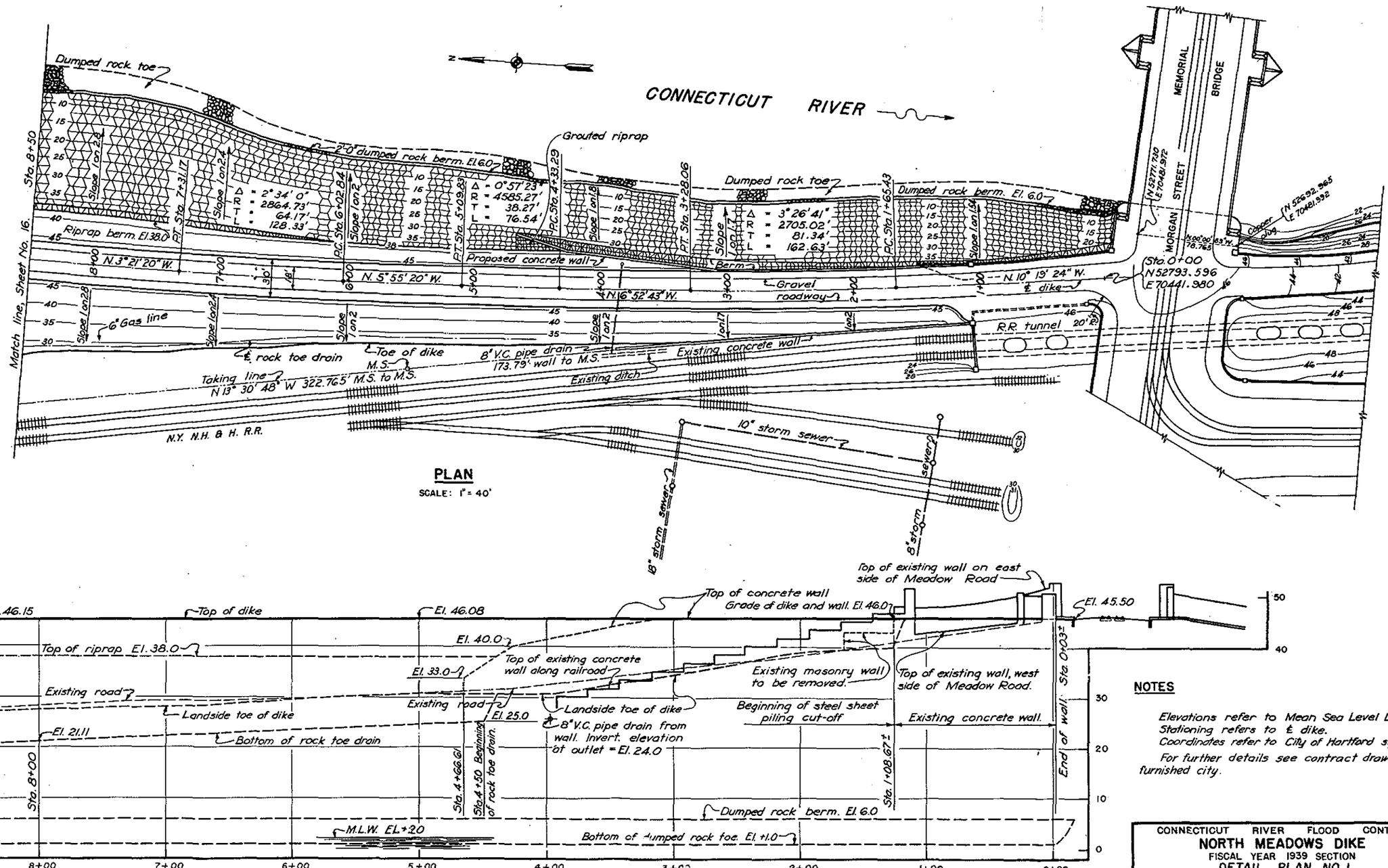
SCALE AS SHOWN

U.S. ENGINEER OFFICE, PROVIDENCE, R.I., NOV. 1945

OPERATION AND MAINTENANCE MANUAL

HARTFORD, CONNECTICUT

PLATE NO. V A



PLAN

SCALE: 1" = 40'

PROFILE

SCALE: HOR. 1" = 40'
VERT. 1" = 10'

NOTES

Elevations refer to Mean Sea Level Datum.
Stationing refers to ℄ dike.
Coordinates refer to City of Hartford system.

For further details see contract drawings furnished city.

CONNECTICUT RIVER FLOOD CONTROL

NORTH MEADOWS DIKE

FISCAL YEAR 1939 SECTION

DETAIL PLAN NO. 1

STA. 0+00 TO STA. 8+50

HARTFORD, CONN.

CONNECTICUT RIVER — CONNECTICUT

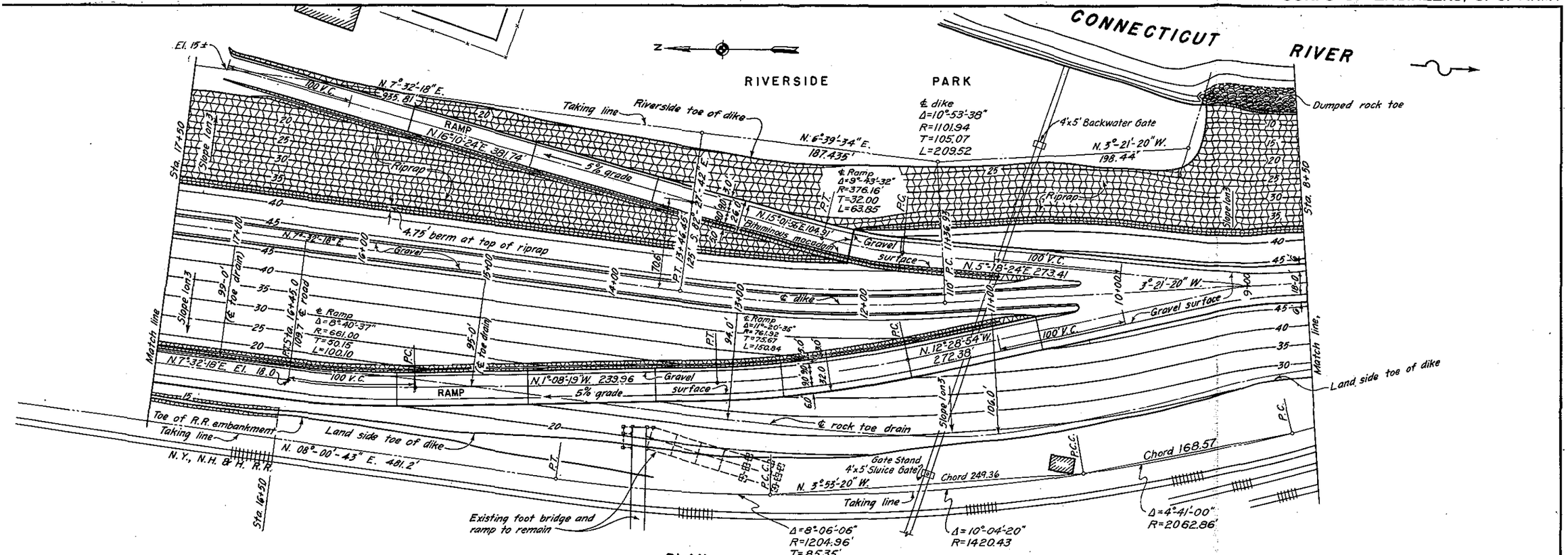
SCALE: 1 IN. = 40 FT.

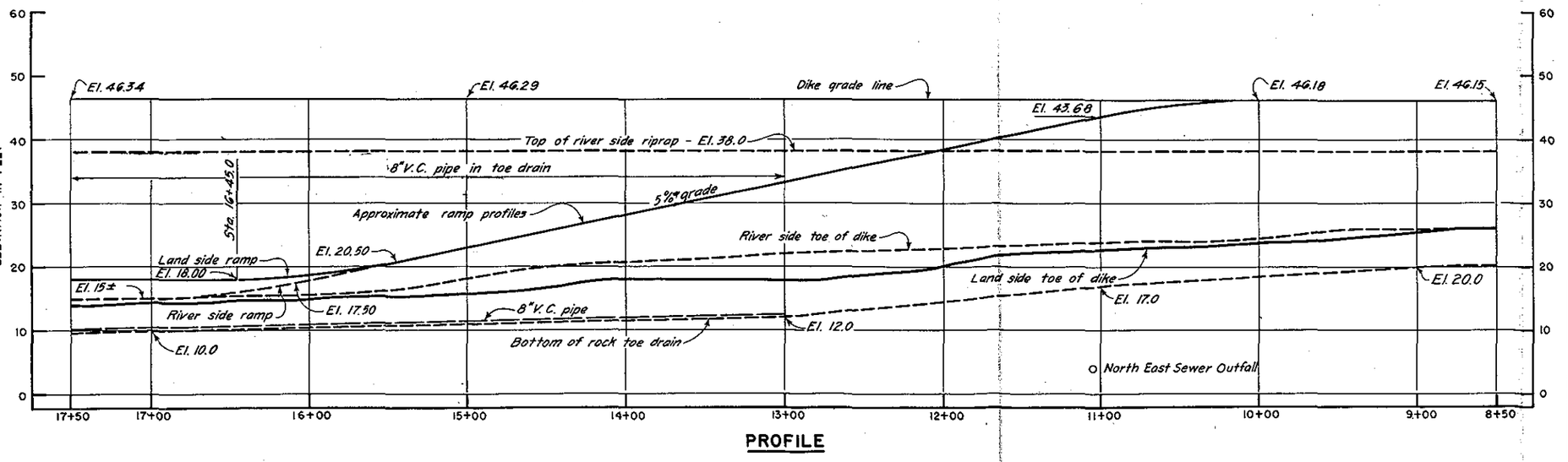
U. S. ENGINEER OFFICE, PROVIDENCE, R. I., APRIL 1939

OPERATION AND MAINTENANCE MANUAL

HARTFORD, CONN.

PLATE VI





NOTES

For general notes applying to details shown on this sheet see Plate VI

CONNECTICUT RIVER FLOOD CONTROL

NORTH MEADOWS DIKE

FISCAL YEAR 1939 SECTION

DETAIL PLAN NO. 2

STA. 8+50 TO STA. 17+50

HARTFORD, CONN.

CONNECTICUT RIVER — CONNECTICUT

SCALE: 1IN. = 40 FT.

U. S. ENGINEER OFFICE, PROVIDENCE, R. I., APRIL 1939

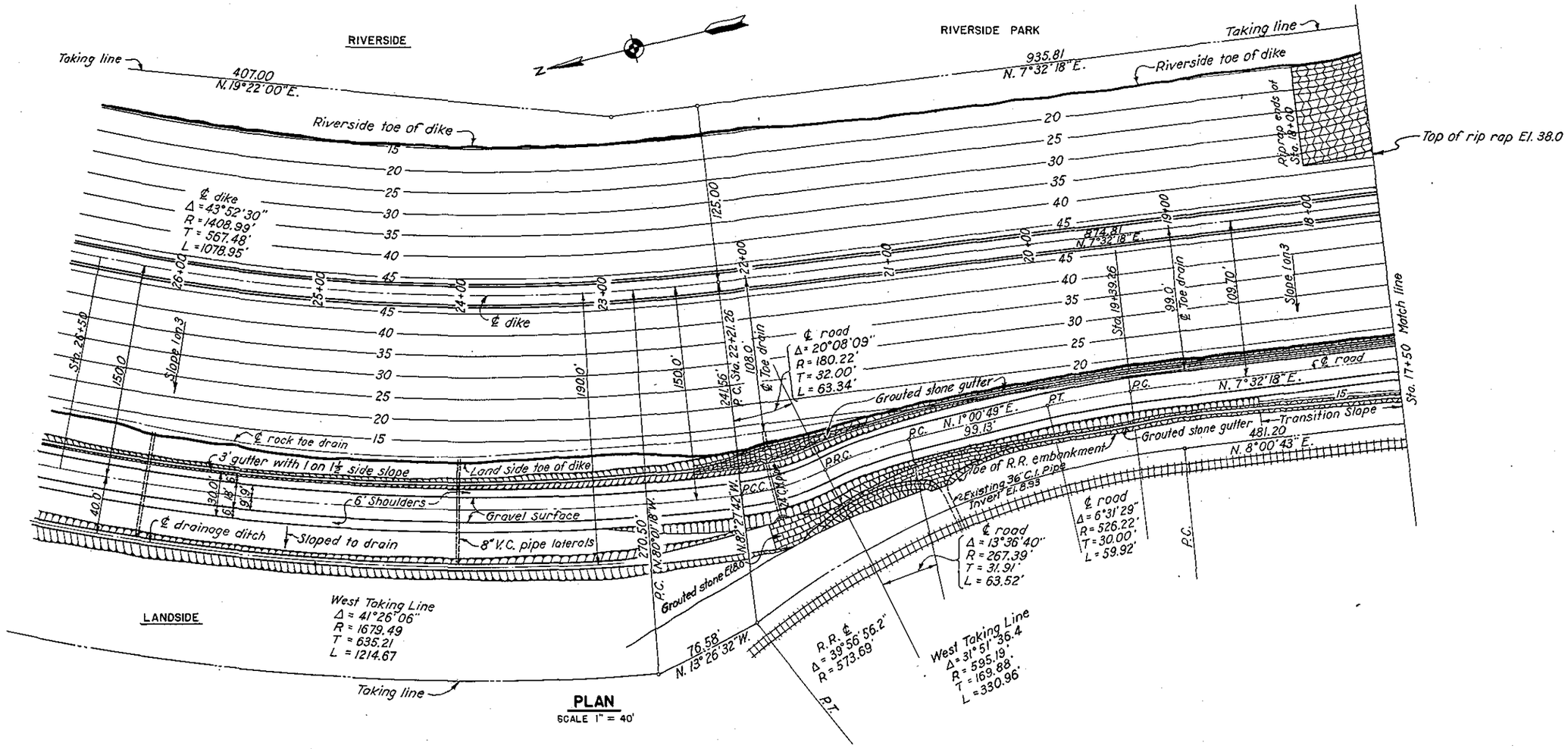
OPERATION AND MAINTENANCE MANUAL

HARTFORD, CONN.

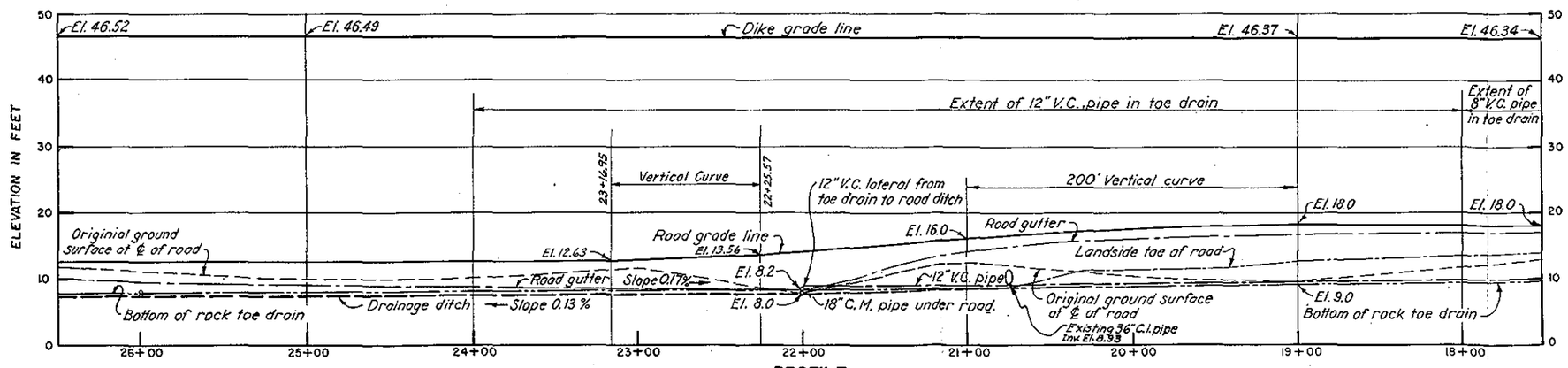
PLATE VII

WAR DEPARTMENT

CORPS OF ENGINEERS, U. S. ARMY



PLAN
SCALE 1" = 40'



PROFILE
STATIONS REFER TO ℄ OF DIKE
SCALE HOR. 1" = 40'
VERT. 1" = 10'

NOTES

For general notes applying to details shown on this sheet, see Plate VI

CONNECTICUT RIVER FLOOD CONTROL

NORTH MEADOWS DIKE
FISCAL YEAR 1939 SECTION
DETAIL PLAN NO. 3
STA. 17+50 TO STA. 26+50
HARTFORD, CONN.

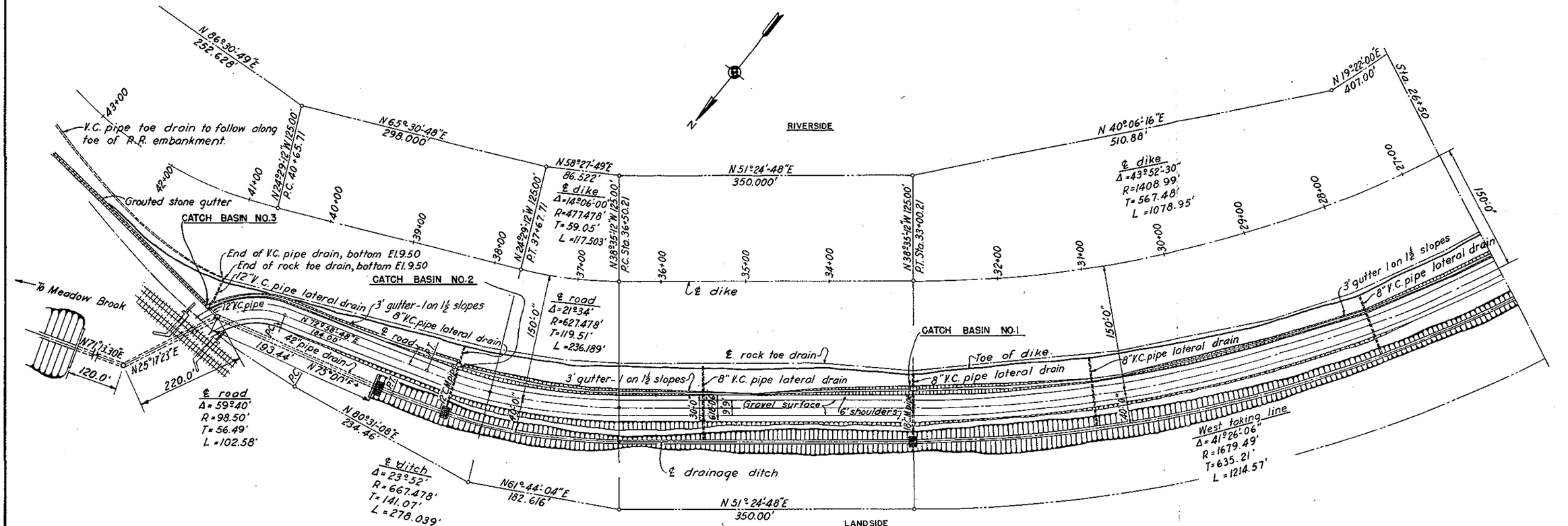
CONNECTICUT RIVER — CONNECTICUT

SCALE 1 IN. = 40 FT.
40' 0 40' 80'

U. S. ENGINEER OFFICE, PROVIDENCE, R. I., APRIL 1939

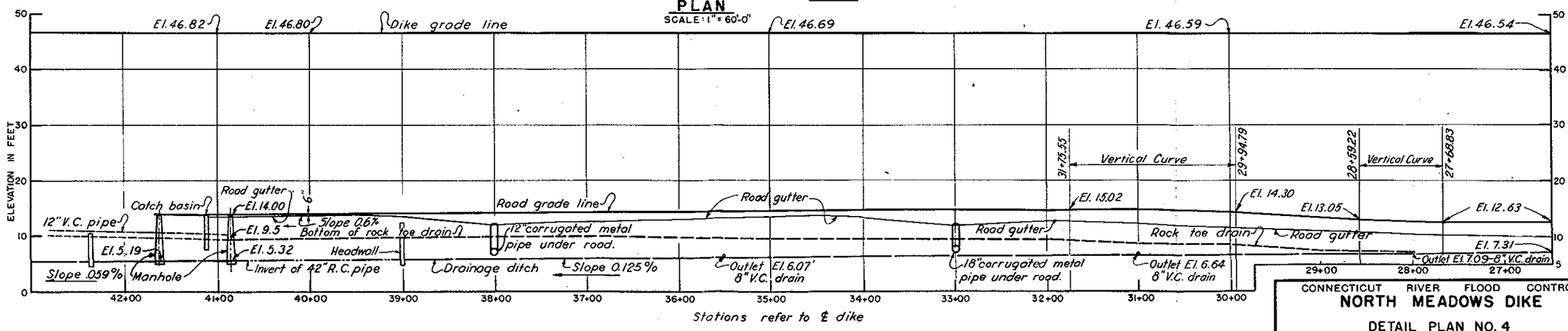
OPERATION AND MAINTENANCE MANUAL
HARTFORD, CONN.

PLATE VIII



PLAN

SCALE: 1" = 60'-0"



Stations refer to ℄ dike

PROFILE

HORIZONTAL SCALE: 1" = 60'-0"
VERTICAL SCALE: 1" = 10'-0"

NOTES

For general notes applying to details shown on this sheet see Plate VI

CONNECTICUT RIVER FLOOD CONTROL

NORTH MEADOWS DIKE

DETAIL PLAN NO. 4

STA. 26+50 TO STA. 41+00 ±

CONNECTICUT RIVER — CONNECTICUT

SCALE: 1 IN. = 60 FT.

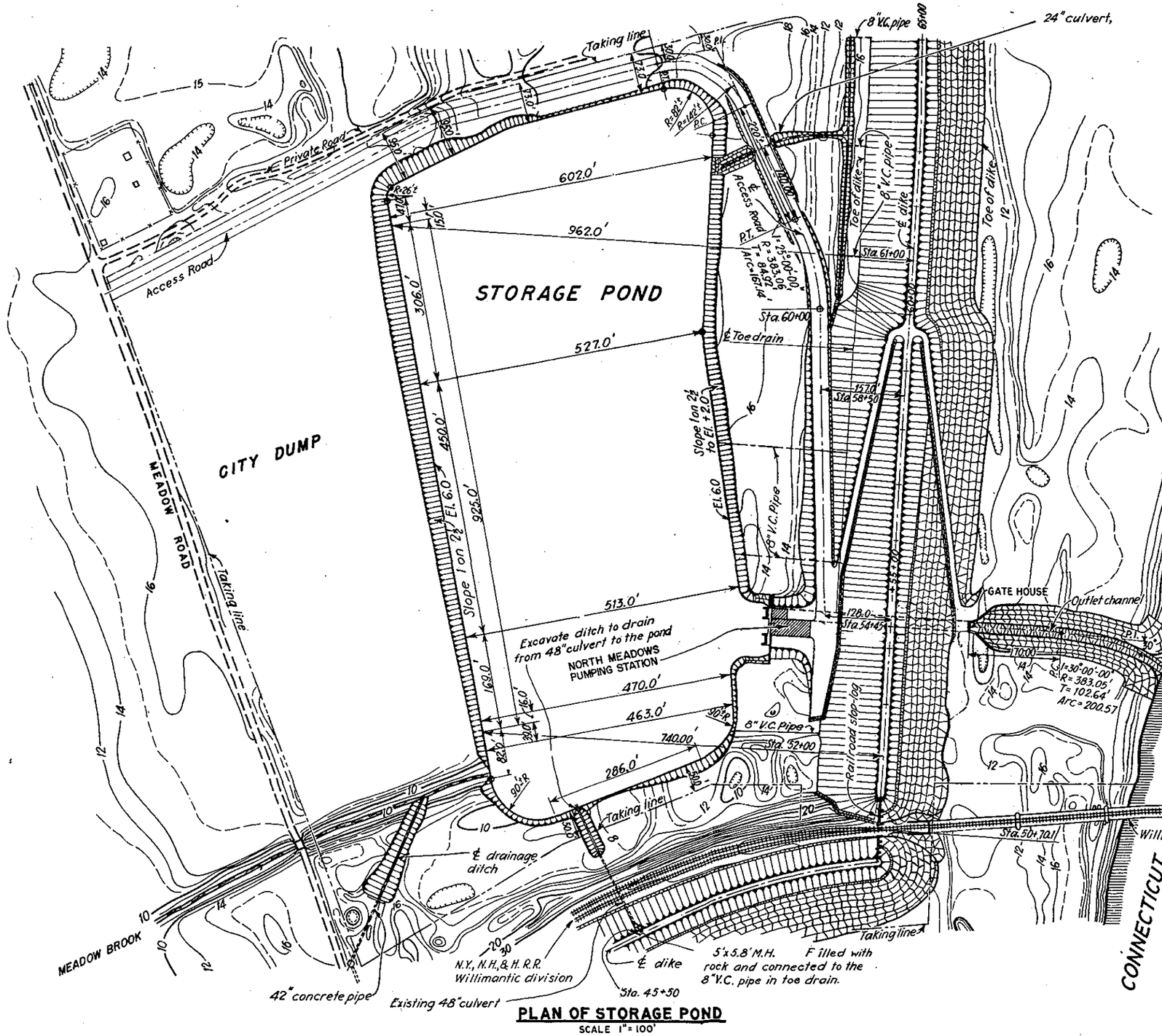
60' 0 60' 120'

U. S. ENGINEER OFFICE, PROVIDENCE, R. I., APRIL 1939

OPERATION AND MAINTENANCE MANUAL

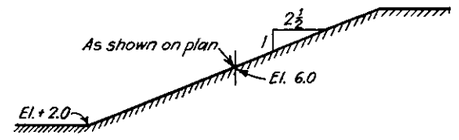
HARTFORD, CONN.

PLATE IX



PLAN OF STORAGE POND

SCALE 1" = 100'



TYPICAL SLOPE SECTION

SCALE 1" = 5'-0"

5' 0 5' 10'

NOTES

For general notes applying to details shown on this sheet, see Plate VI

CONNECTICUT RIVER FLOOD CONTROL

NORTH MEADOWS DIKE

FISCAL YEAR 1939 SECTION

PUMPING STATION POND LAYOUT

HARTFORD, CONN.

CONNECTICUT RIVER — CONNECTICUT

SCALE: 1 IN. = 100 FT.

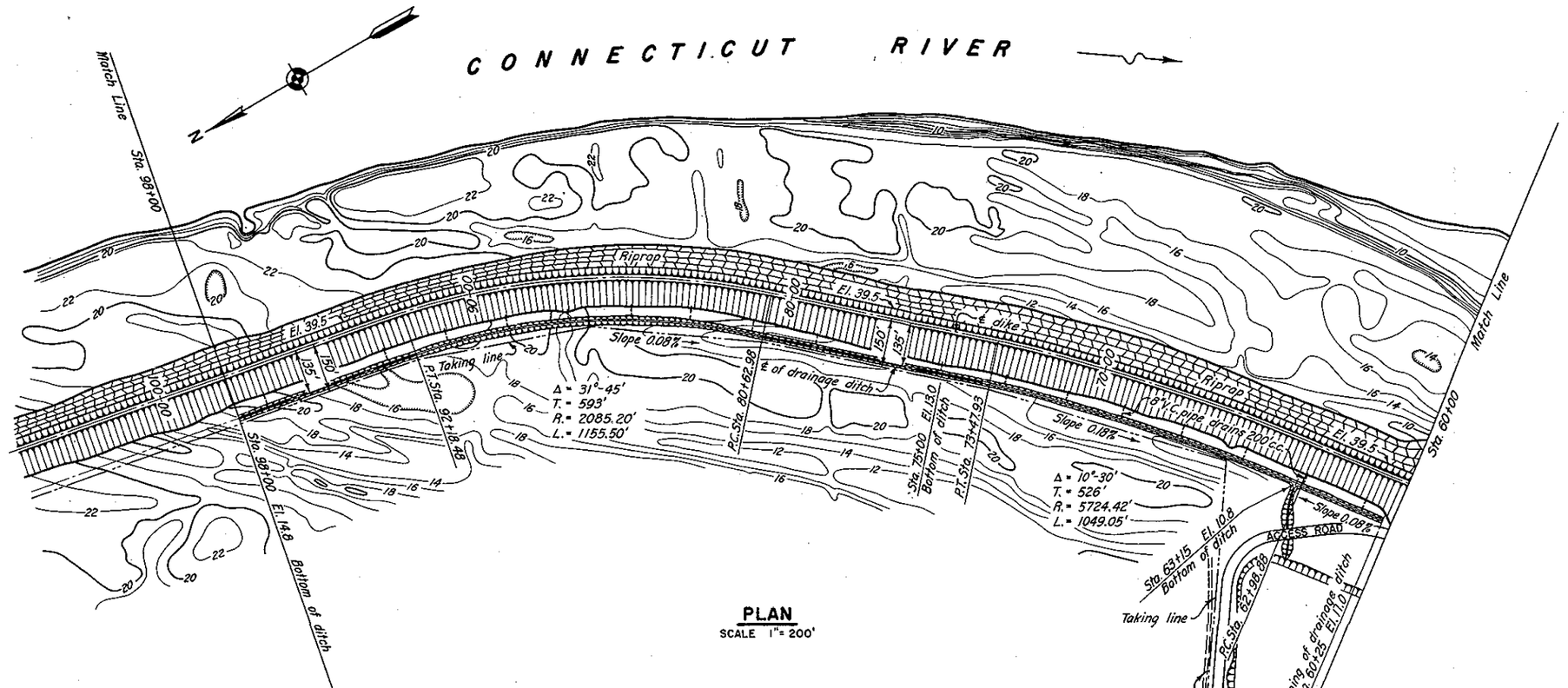
100' 0 100' 200'

U.S. ENGINEER OFFICE, PROVIDENCE, R.I., APRIL 1939

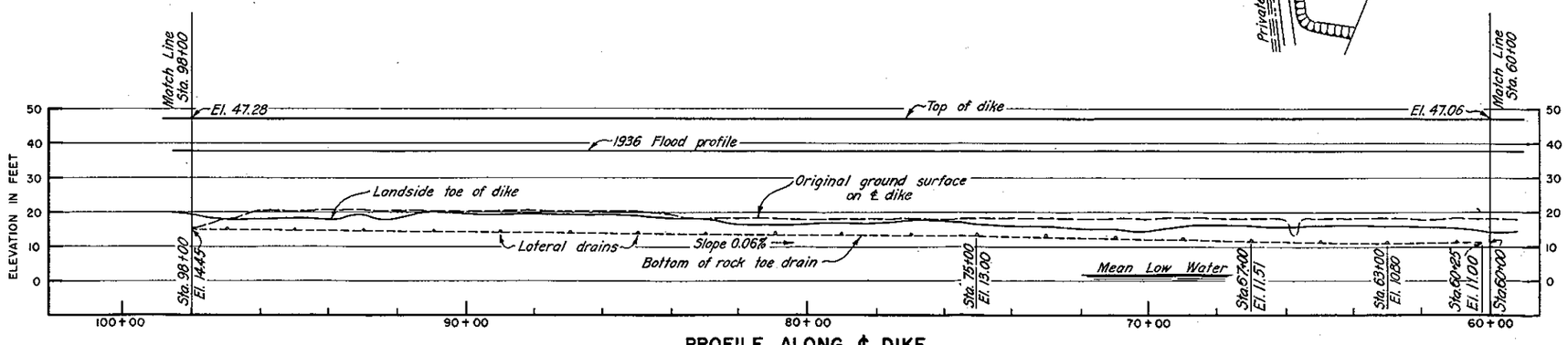
OPERATION AND MAINTENANCE MANUAL

HARTFORD, CONN.

PLATE X



PLAN
SCALE 1"= 200'



PROFILE ALONG ℄ DIKE
SCALE: HOR. 1"= 200'
VERT. 1"= 20'

SCHEDULE OF 8" V.C. LATERAL TILE DRAINS	
STATION	LIN. FT.
3+83	76
24+00	74
26+00	78
28+00	78
31+00	86
33+00	22
35+50	88
38+00	26
52+40	58
55+50	198
57+50	242
61+00	38
63+00	38
65+00	42
67+00	40
69+00	40
71+00	40
73+00	36
75+00	36
77+00	40
79+00	38
81+00	38
83+00	46
85+00	46
87+00	46
89+00	48
91+00	54
93+00	50
95+00	42
97+00	44
102+00	38
104+00	50
106+00	50
108+00	50
110+00	46
112+00	48
114+00	46
119+00	56
121+00	54
123+00	50
125+00	50
127+00	50
129+00	24
131+00	30
133+00	26
135+00	42
140+00	36
142+00	36
144+00	36
146+00	40
148+00	36
150+00	36
152+00	36

NOTE:

For general notes applying to details shown on this sheet, see Plate III

CONNECTICUT RIVER FLOOD CONTROL

NORTH MEADOWS DIKE

FISCAL YEAR 1939 SECTION

GENERAL PLAN NO. 1

HARTFORD, CONN.

CONNECTICUT RIVER — CONNECTICUT

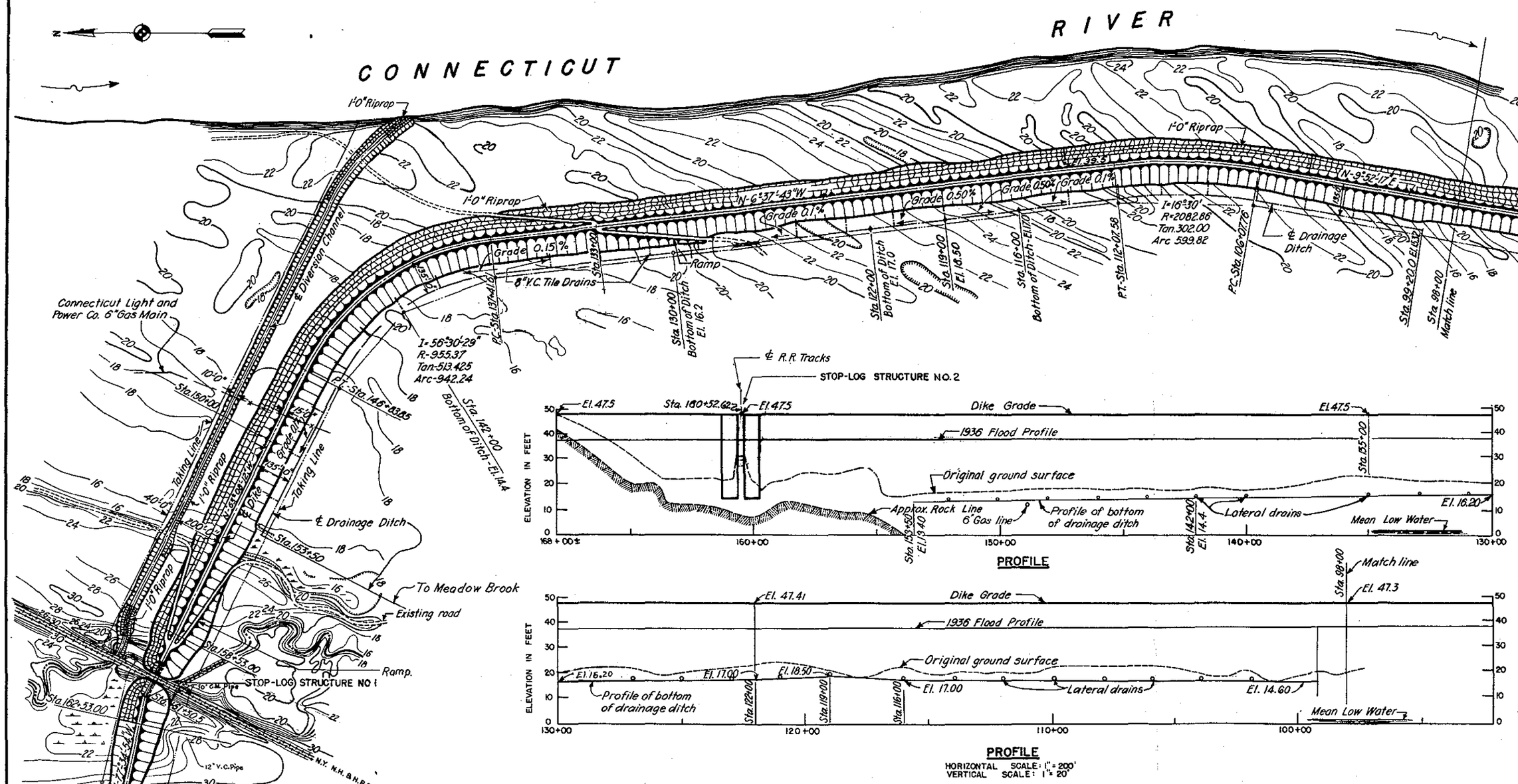
SCALE 1 IN. = 200 FT.

U. S. ENGINEER OFFICE, PROVIDENCE, R. I., APRIL, 1939

OPERATION AND MAINTENANCE MANUAL

HARTFORD, CONN.

PLATE XI



NOTE

Elevations refer to Mean Sea Level Datum
For general notes applying to details shown on this sheet see Plate VI.

CONNECTICUT RIVER FLOOD CONTROL

NORTH MEADOWS DIKE

FISCAL YEAR 1939 SECTION

GENERAL PLAN NO. 2

HARTFORD, CONN.

CONNECTICUT RIVER — CONNECTICUT

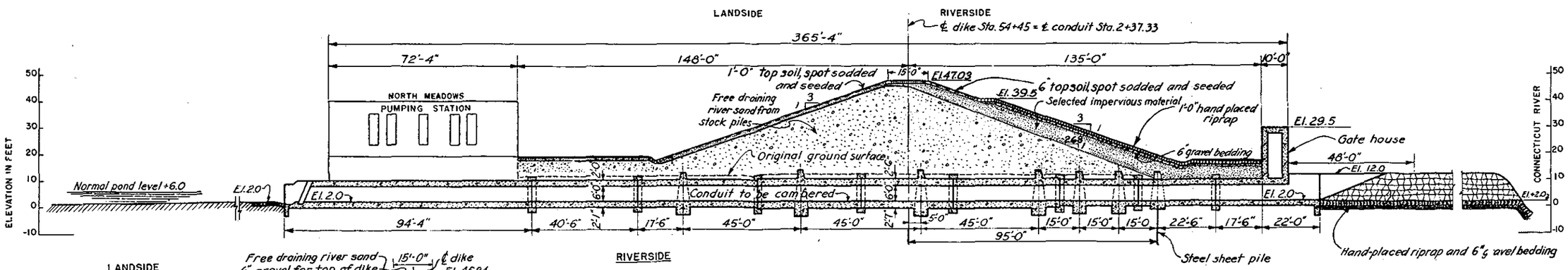
SCALE : 1 IN. = 200 FT.

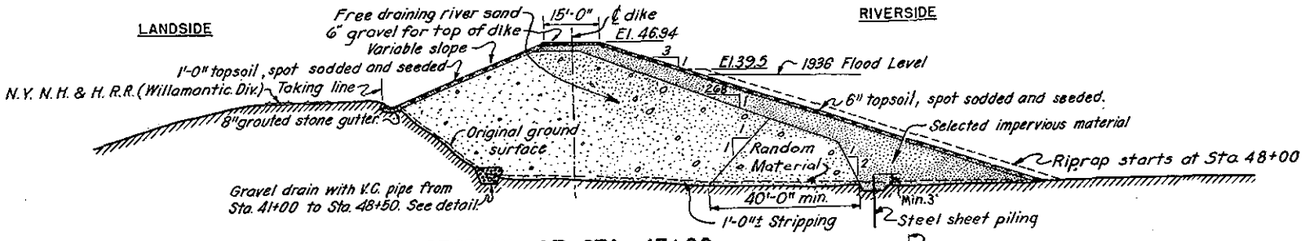
200' 0 200' 400'

U.S. ENGINEER OFFICE, PROVIDENCE, R.I. — APRIL 1939

OPERATION AND MAINTENANCE MANUAL
HARTFORD, CONN.

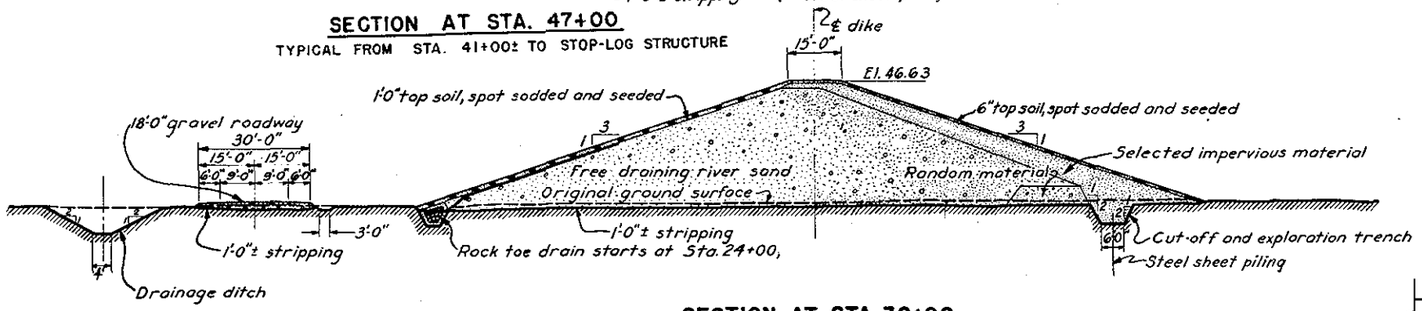
PLATE XII





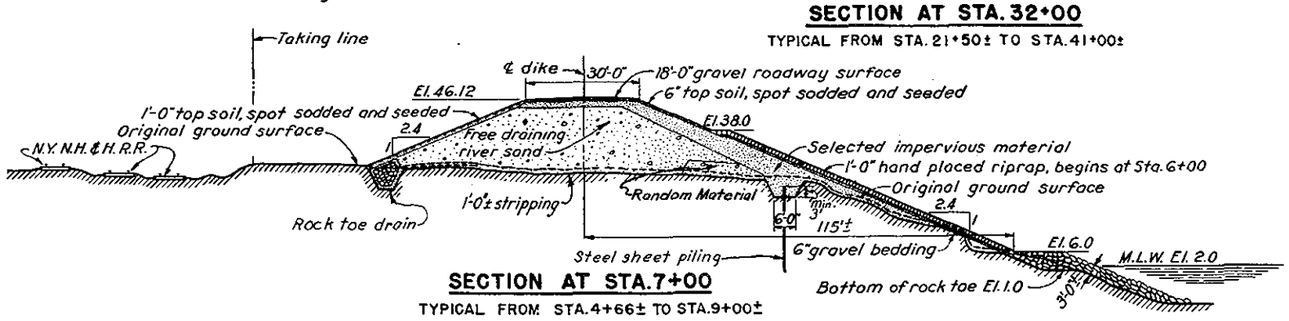
SECTION AT STA. 47+00

TYPICAL FROM STA. 41+00± TO STOP-LOG STRUCTURE



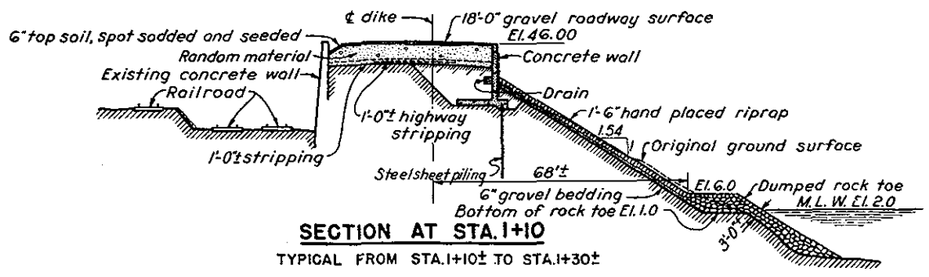
SECTION AT STA. 32+00

TYPICAL FROM STA. 21+50± TO STA. 41+00±



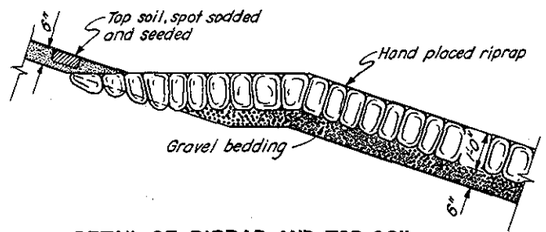
SECTION AT STA. 7+00

TYPICAL FROM STA. 4+66± TO STA. 9+00±



SECTION AT STA. 1+10

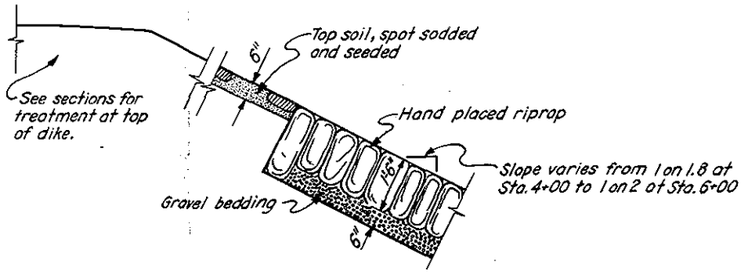
TYPICAL FROM STA. 1+10± TO STA. 1+30±



DETAIL OF RIPRAP AND TOP SOIL

TYPICAL FROM STA. 6+00 TO STA. 18+00 AND STA. 48+00 TO STA. 162+53

SCALE: 1/2" = 1'-0"



DETAIL OF RIPRAP AND TOP SOIL

TYPICAL FROM STA. 4+32± TO STA. 6+00

SCALE: 1/2" = 1'-0"

CONNECTICUT RIVER FLOOD CONTROL

NORTH MEADOWS DIKE

TYPICAL CROSS-SECTIONS NO. I

CONNECTICUT RIVER — CONNECTICUT

SCALE 1 IN. = 20 FT.

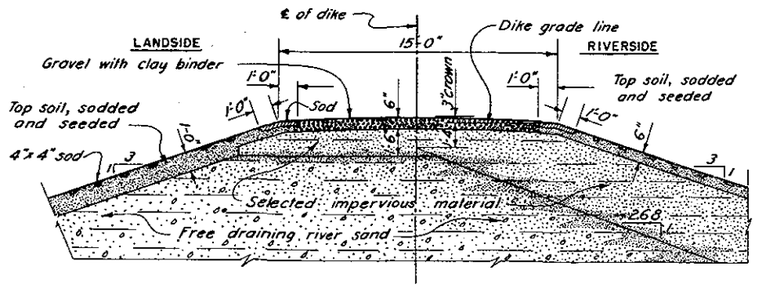
20' 0 20' 40'

U. S. ENGINEER OFFICE, PROVIDENCE, R. I.,

OPERATION AND MAINTENANCE MANUAL

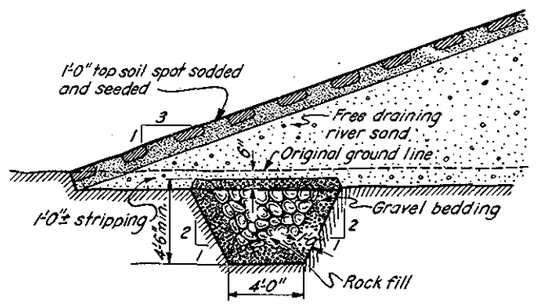
HARTFORD, CONN.

PLATE XIII



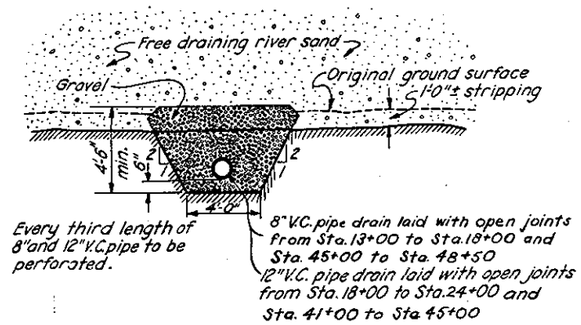
DETAIL OF TOP OF DIKE

SCALE $\frac{1}{4}$" = 1'-0"



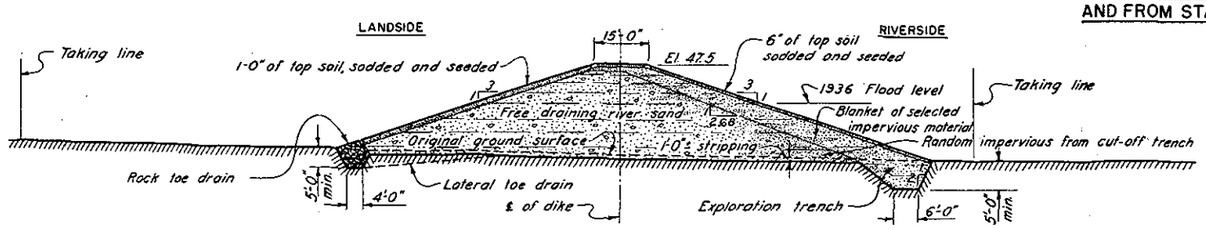
TYPICAL FROM STA. 4+50 TO STA. 13+00
AND FROM STA. 51+30± TO STA. 60+30±

SCALE: $\frac{1}{4}$" = 1'-0"



TYPICAL FROM STA. 13+00 TO STA. 24+00

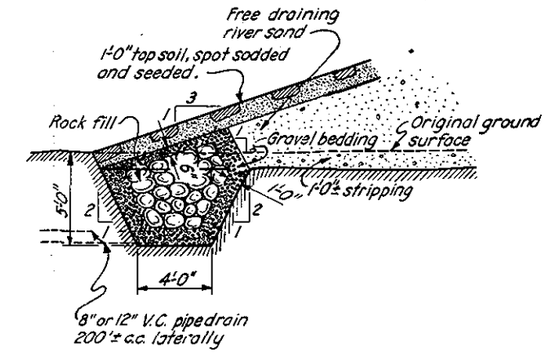
SCALE: $\frac{1}{4}$" = 1'-0"



SECTION AT STA. 164+00

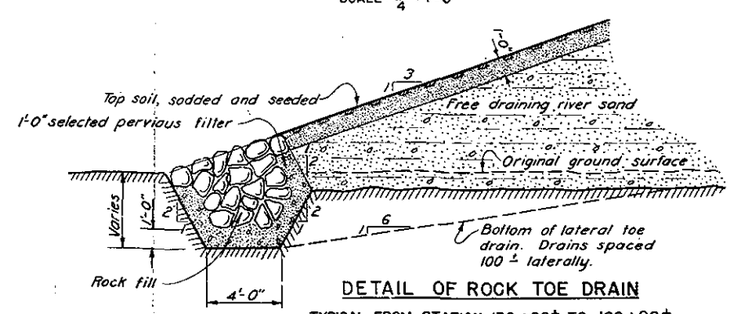
TYPICAL FROM STA. 161+53 TO STA. 168+00

SCALE 1" = 20'



TYPICAL FROM STA. 24+00 TO STA. 41+00±
AND FROM STA. 60+30± TO STA. 130+00

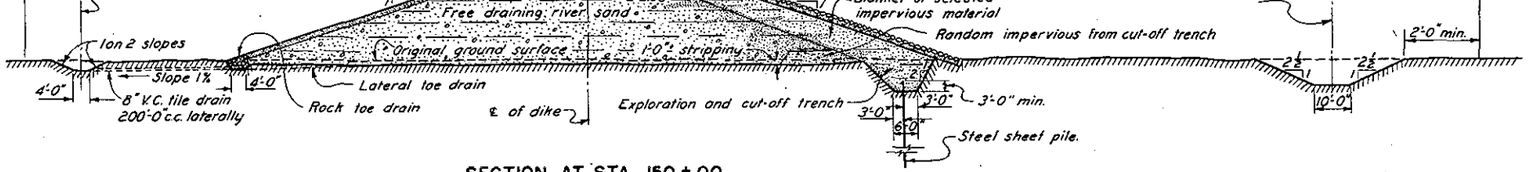
SCALE: $\frac{1}{4}$" = 1'-0"



DETAIL OF ROCK TOE DRAIN

TYPICAL FROM STATION 130+00± TO 168+00±

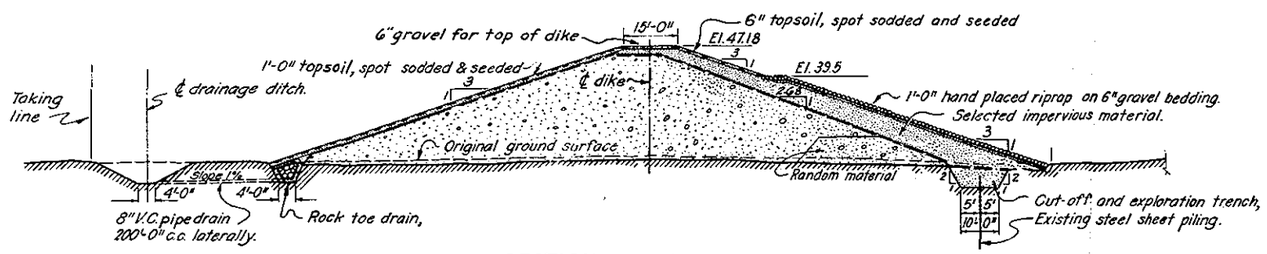
SCALE: $\frac{1}{4}$" = 1'-0"



SECTION AT STA. 150+00

TYPICAL FROM STA. 138+00 TO STA. 159+53

SCALE 1" = 20'



SECTION AT STA. 80+00

TYPICAL FROM STA. 60+00± TO STA. 130+00

SCALE 1" = 20'

CONNECTICUT RIVER FLOOD CONTROL

NORTH MEADOWS DIKE

FISCAL YEAR 1939 SECTION

TYPICAL CROSS SECTIONS NO. 2

HARTFORD, CONN.

CONNECTICUT RIVER — CONNECTICUT

SCALE: 1 IN. = 20 FT.

20' 0 20' 40'

U. S. ENGINEER OFFICE, PROVIDENCE, R. I.

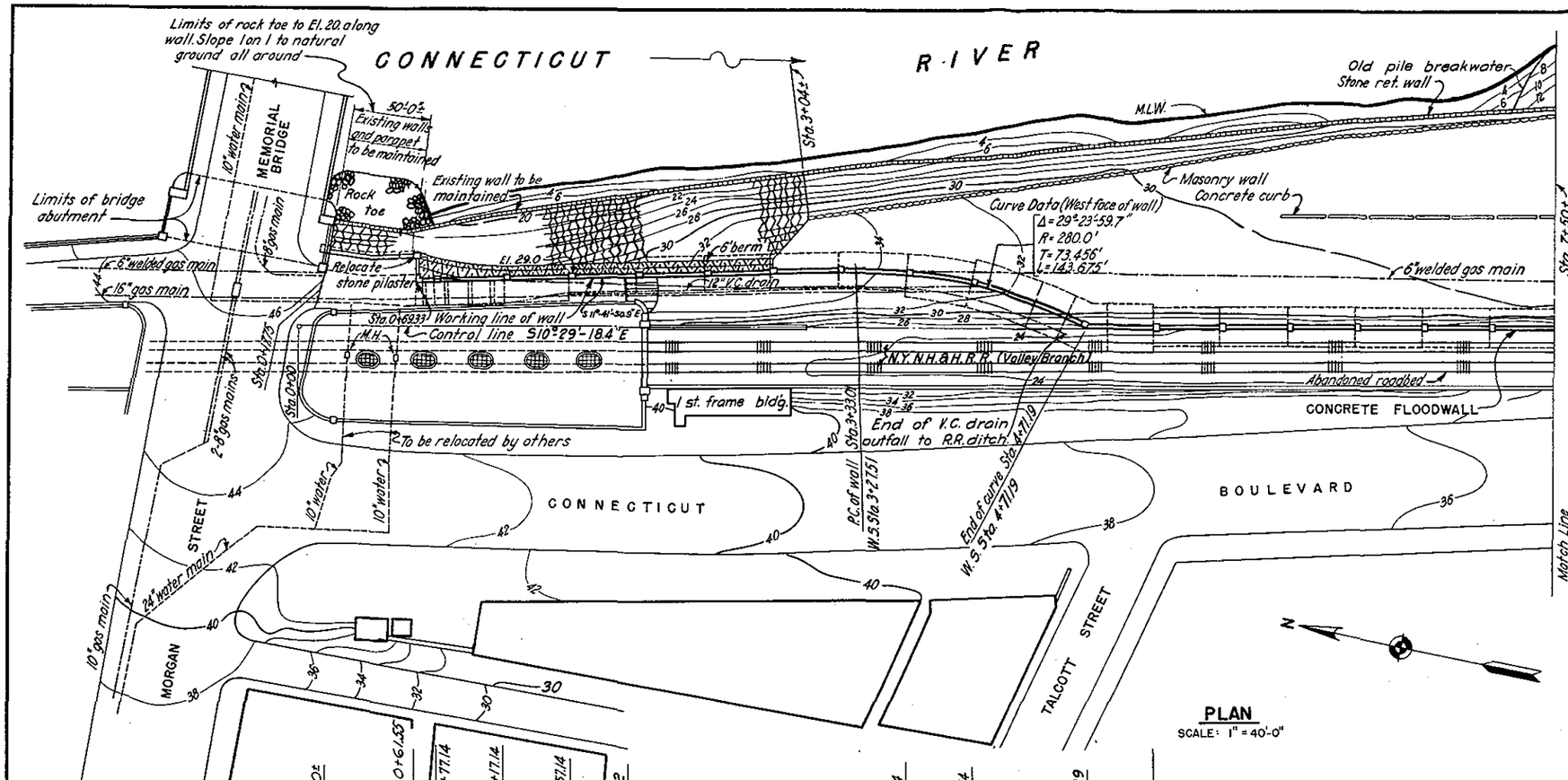
OPERATION AND MAINTENANCE MANUAL

HARTFORD, CONN.

PLATE XIV

WAR DEPARTMENT

CORPS OF ENGINEERS, U. S. ARMY



PLAN

SCALE: 1" = 40'-0"

PROFILE

SCALE: VERT. - 1" = 20'
HOR. - 1" = 40'

STATION COORDINATES

STATION	NORTHINGS	EASTINGS
Sta. 0+00	N-52702.72	E-70426.80
L.Pt. Sta. 0+42.71	N-52665.65	E-70461.16
P.C. Sta. 3+33.01	N-52381.31	E-70520.03
End of curve Sta. 4+71.19	N-52239.40	E-70512.58

NOTES

All elevations refer to Mean Sea Level Datum.
For general notes applying to details shown on this sheet, see Plate III.
Stations noted (W.S.) are taken along west face of proposed wall where control line and west face of wall do not coincide.

CONNECTICUT RIVER FLOOD CONTROL

HARTFORD DIKE

RIVERFRONT, MORGAN ST. TO STA. 97+05

PLAN AND PROFILE NO. I

CONNECTICUT RIVER — CONNECTICUT

SCALE: 1 IN. = 40 FT.

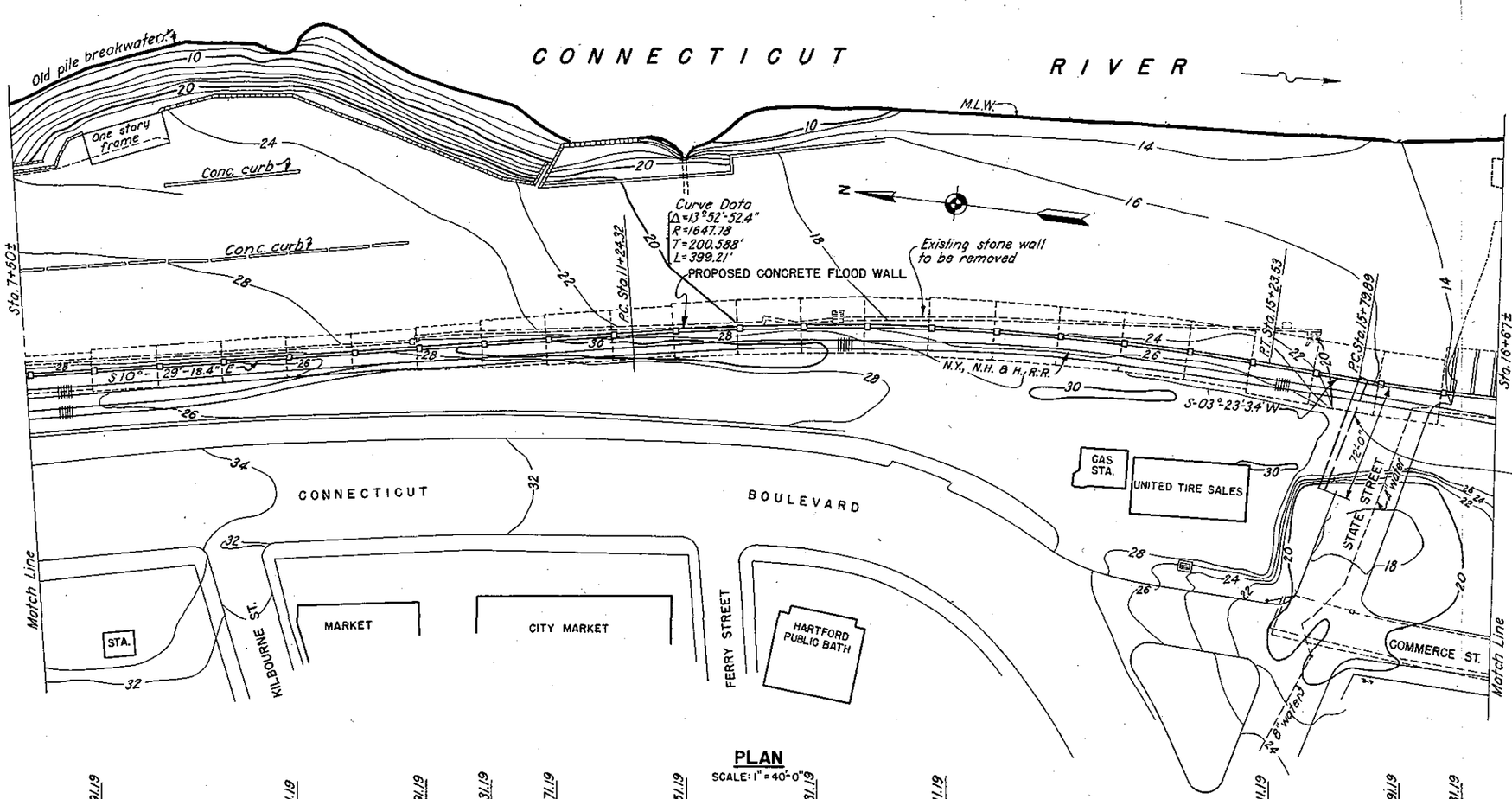
40' 0 40' 80'

U. S. ENGINEER OFFICE, PROVIDENCE, R.I., MAY 1940

OPERATION AND MAINTENANCE MANUAL

HARTFORD, CONN.

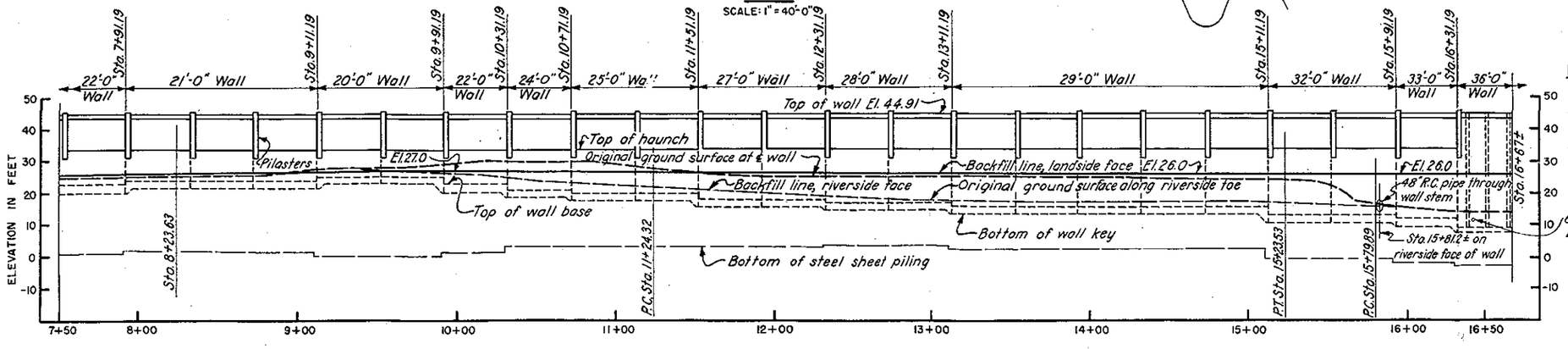
PLATE XV



STATION COORDINATES		
STATION	NORTHINGS	EASTINGS
POT Sta.8+23.63	N-51892.85	E-70576.74
P.C. Sta. 11+24.32	N-51597.18	E-70631.47
P.T. Sta. 15+23.53	N-51199.71	E-70656.12
P.C. Sta. 15+79.89	N-51143.45	E-70652.78

PLAN

SCALE: 1" = 40'-0"



PROFILE

SCALE: VERT. 1" = 20'-0"
HOR. 1" = 40'-0"

NOTES

For general notes applying to this sheet see Plate VI.

Alignment data refers to west face of proposed walls.

CONNECTICUT RIVER FLOOD CONTROL

HARTFORD DIKE

RIVERFRONT, MORGAN ST. TO STA. 97+05

PLAN AND PROFILE NO. 2

CONNECTICUT RIVER CONNECTICUT

SCALE: 1 IN. = 40 FT.

40' 0 40' 80'

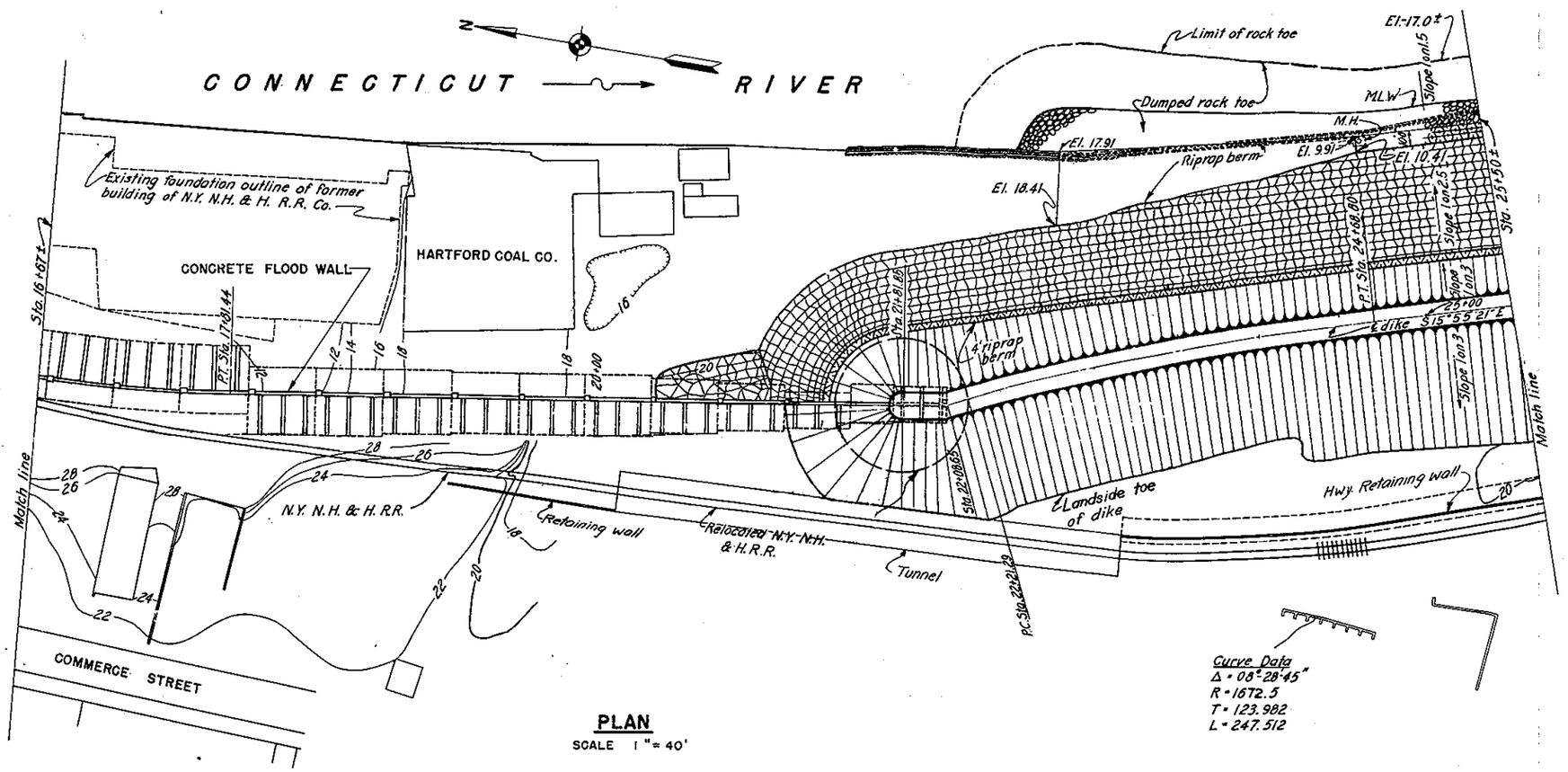
U.S. ENGINEER OFFICE, PROVIDENCE, R.I., MAY 1940

OPERATION AND MAINTENANCE MANUAL

HARTFORD, CONN.

PLATE XVI

3)



PLAN

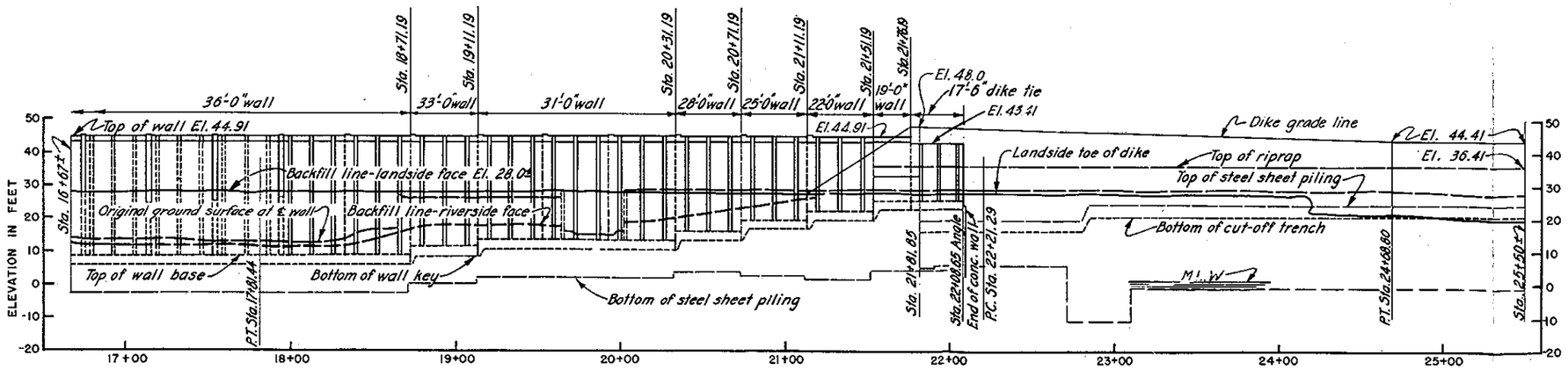
SCALE 1"= 40'

STATION COORDINATES		
STATION	NORTHINGS	EASTINGS
P.T. Sta. 17+81.44	N- 50942.44	E- 70661.14
P.O.T. Sta. 21+81.85	N- 50546.05	E- 70717.94
∠ Sta. 22+08.65	N- 50519.32	E- 70721.75
P.C. Sta. 22+21.29	N- 50508.01	E- 70726.97
P.T. Sta. 24+68.80	N- 50275.88	E- 70812.20

Curve Data
Δ = 08°-28'-45"
R = 1672.5
T = 123.982
L = 247.512

NOTES

For general notes applying to this sheet see Plate VI.



PROFILE

SCALE: HOR. 1"=40'
VER. 1"=20

CONNECTICUT RIVER FLOOD CONTROL

HARTFORD DIKE

RIVERFRONT, MORGAN ST. TO STA. 96+73

PLAN AND PROFILE NO. 3

CONNECTICUT RIVER — CONNECTICUT

SCALE: 1 IN. = 40 FT.

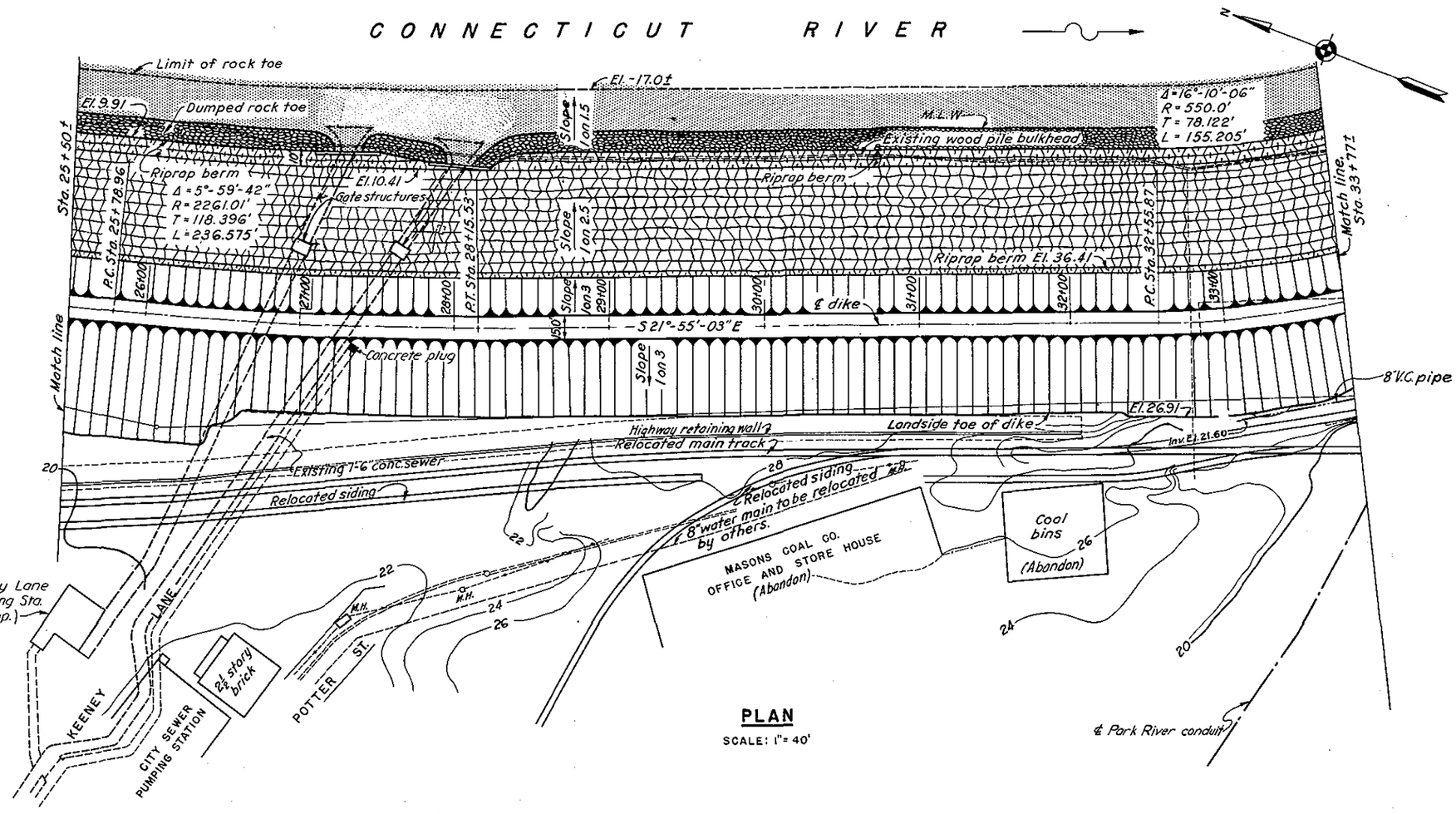
40' 0 40' 80'

U.S. ENGINEER OFFICE, PROVIDENCE, R.I., MAY 1940

OPERATION AND MAINTENANCE MANUAL

HARTFORD, CONN.

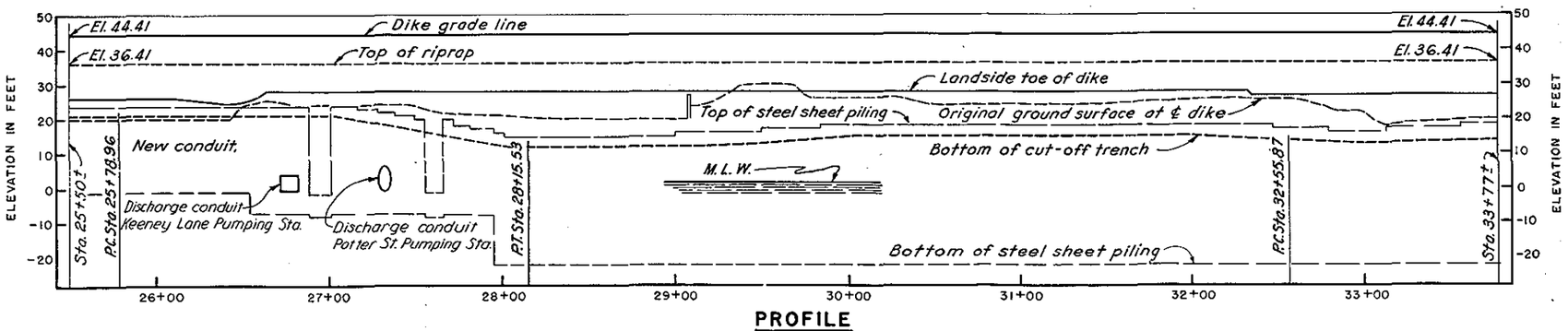
PLATE XVII



PLAN

SCALE: 1" = 40'

STATION COORDINATES		
STATION	NORTHINGS	EASTINGS
P.C. Sta. 25+78.96	N50169.95	E 70842.42
P.T. Sta. 28+15.53	N49946.25	E 70919.09
P.C. Sta. 32+55.87	N49537.75	E 71083.46



PROFILE

SCALE: HOR., 1" = 40'
VERT., 1" = 20'

NOTES

For general notes applying to this sheet, see Plate VI

CONNECTICUT RIVER FLOOD CONTROL

HARTFORD DIKE

RIVERFRONT, MORGAN ST. TO STA. 97+05

PLAN AND PROFILE NO. 4

CONNECTICUT RIVER — CONNECTICUT

SCALE: 1 IN. = 40 FT.

U.S. ENGINEER OFFICE, PROVIDENCE, R.I., MAY 1940

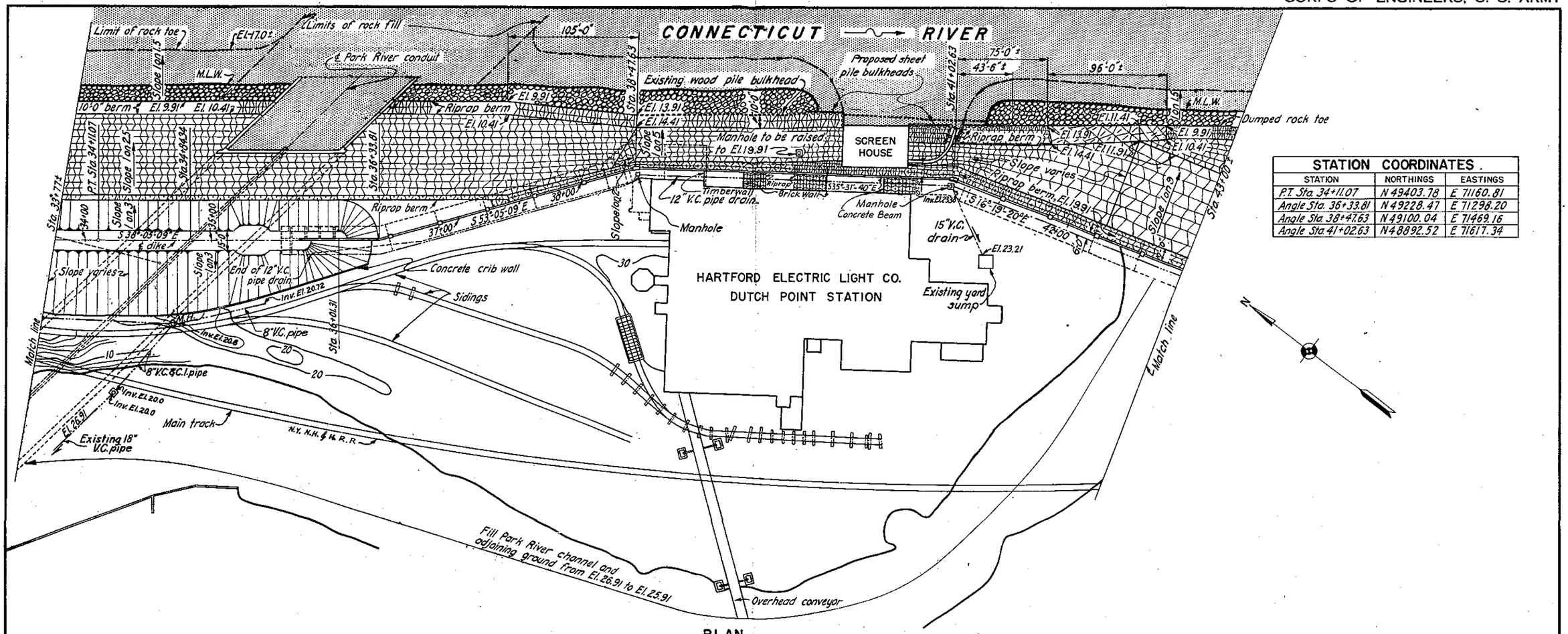
OPERATION AND MAINTENANCE MANUAL

HARTFORD, CONN.

PLATE XVIII

WAR DEPARTMENT

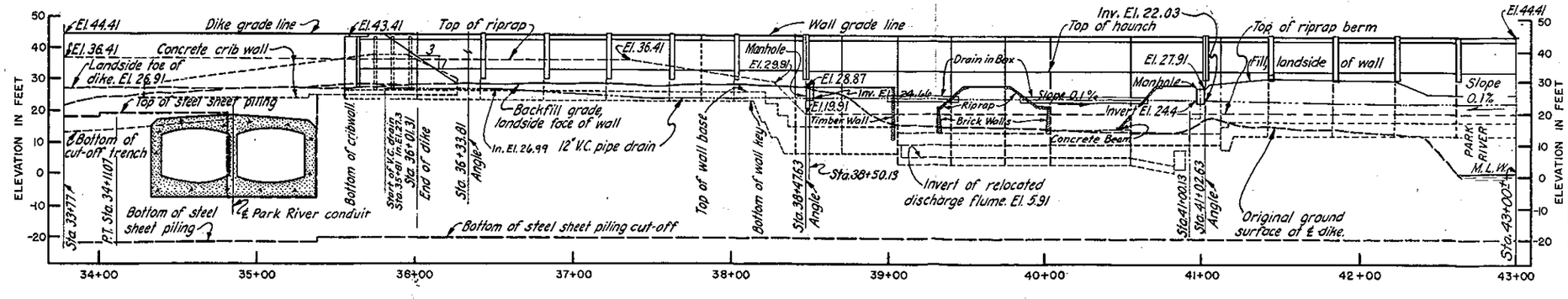
CORPS OF ENGINEERS, U. S. ARMY



PLAN

SCALE: 1" = 40'

STATION COORDINATES		
STATION	NORTHINGS	EASTINGS
P.T. Sta. 34+11.07	N 49403.78	E. 71160.81
Angle Sta. 36+33.81	N 49228.47	E. 71298.20
Angle Sta. 38+47.63	N 49100.04	E. 71469.16
Angle Sta. 41+02.63	N 48892.52	E. 71617.34



PROFILE

SCALES: HOR. 1" = 40'
VERT. 1" = 20'

NOTES

For general notes applying to this sheet see Plate VI

Alignment data refers to west face of proposed wall.

CONNECTICUT RIVER FLOOD CONTROL

HARTFORD DIKE

RIVERFRONT, MORGAN ST. TO STA. 97+05

PLAN AND PROFILE NO. 5

CONNECTICUT RIVER — CONNECTICUT

SCALE: 1 IN. = 40 FT.

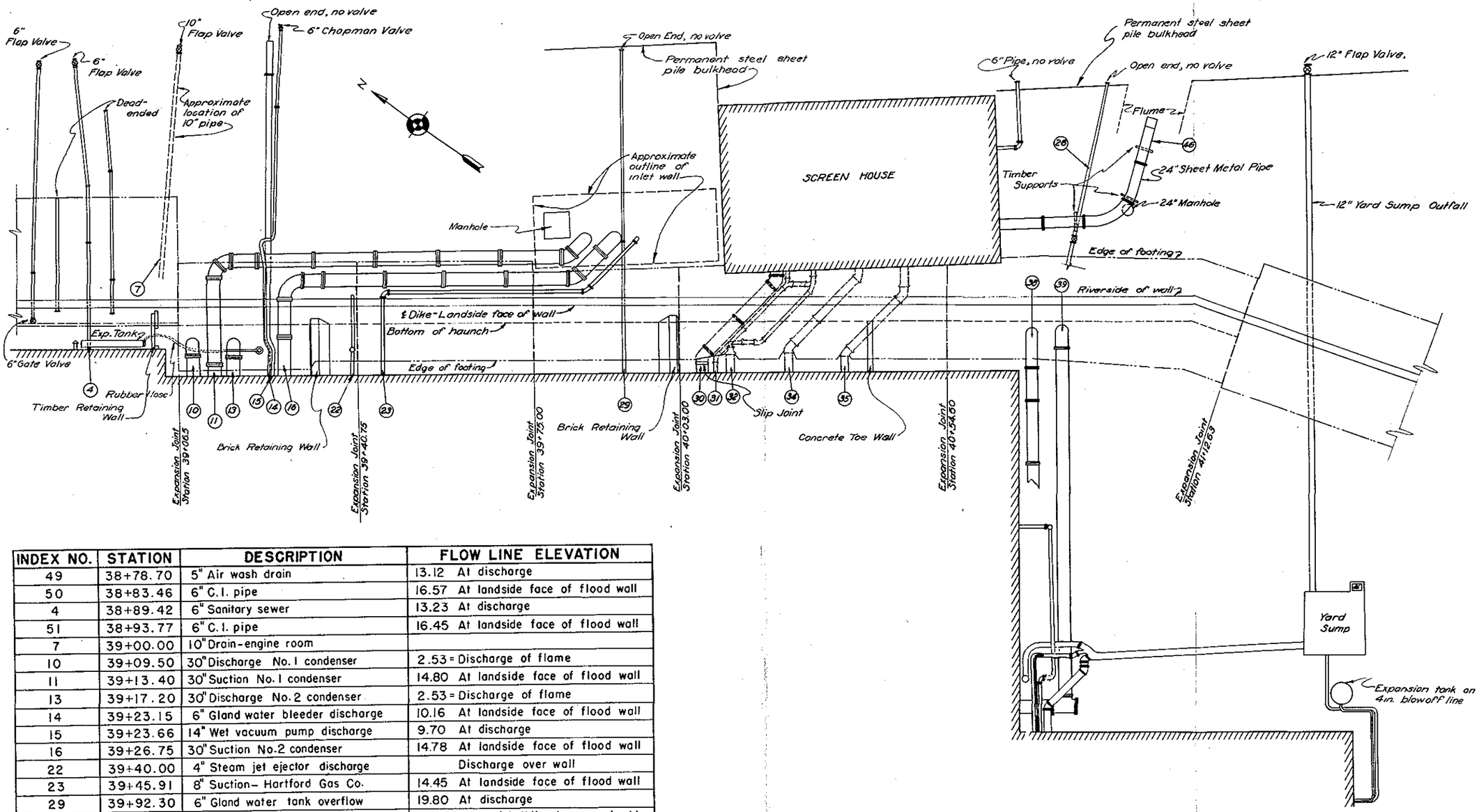
40' 0 40' 80'

U.S. ENGINEER OFFICE, PROVIDENCE, R.I., MAY 1940

OPERATION AND MAINTENANCE MANUAL

HARTFORD, CONN.

PLATE XIX



INDEX NO.	STATION	DESCRIPTION	FLOW LINE ELEVATION
49	38+78.70	5" Air wash drain	13.12 At discharge
50	38+83.46	6" C.I. pipe	16.57 At landside face of flood wall
4	38+89.42	6" Sanitary sewer	13.23 At discharge
51	38+93.77	6" C.I. pipe	16.45 At landside face of flood wall
7	39+00.00	10" Drain-engine room	
10	39+09.50	30" Discharge No. 1 condenser	2.53 = Discharge of flame
11	39+13.40	30" Suction No. 1 condenser	14.80 At landside face of flood wall
13	39+17.20	30" Discharge No. 2 condenser	2.53 = Discharge of flame
14	39+23.15	6" Gland water bleeder discharge	10.16 At landside face of flood wall
15	39+23.66	14" Wet vacuum pump discharge	9.70 At discharge
16	39+26.75	30" Suction No. 2 condenser	14.78 At landside face of flood wall
22	39+40.00	4" Steam jet ejector discharge	Discharge over wall
23	39+45.91	8" Suction - Hartford Gas Co.	14.45 At landside face of flood wall
29	39+92.30	6" Gland water tank overflow	19.80 At discharge
30	40+15.75	28" Suction No. 5 condenser	11.34 Face of building (power plant)
31	40+17.75	8" Suction gland water pumps	12.88 Face of building (power plant)
31	40+17.75	8" Suction fire pump	11.88 Face of building (power plant)
32	40+25.50	8" Discharge No. 5 turbine	12.21 At landside face of flood wall
34	40+30.50	18" Suction No. 6 condenser	12.08 Face of building (power plant)
35	40+44.70	18" Suction No. 7 condenser	12.11 Face of building (power plant)
38	40+71.20	28" Discharge No. 5 condenser	2.53 = Discharge of flame
39	40+77.00	30" Discharge No. 6 and 7 condenser	2.53 = Discharge of flame
26	40+84.00	6" Flume drain	3.03 At discharge
52	41+26.98	12" Yard sump outfall	8.47 At landside face of flood wall

NOTES

All elevations shown on this sheet refer to U.S. Weather Bureau Datum.

All open end pipes shown are controlled by valves inside the station.

CONNECTICUT RIVER FLOOD CONTROL
HARTFORD DIKE
RIVERFRONT, MORGAN ST. TO STA. 97+05
DETAIL PLAN-DUTCH PT. STATION

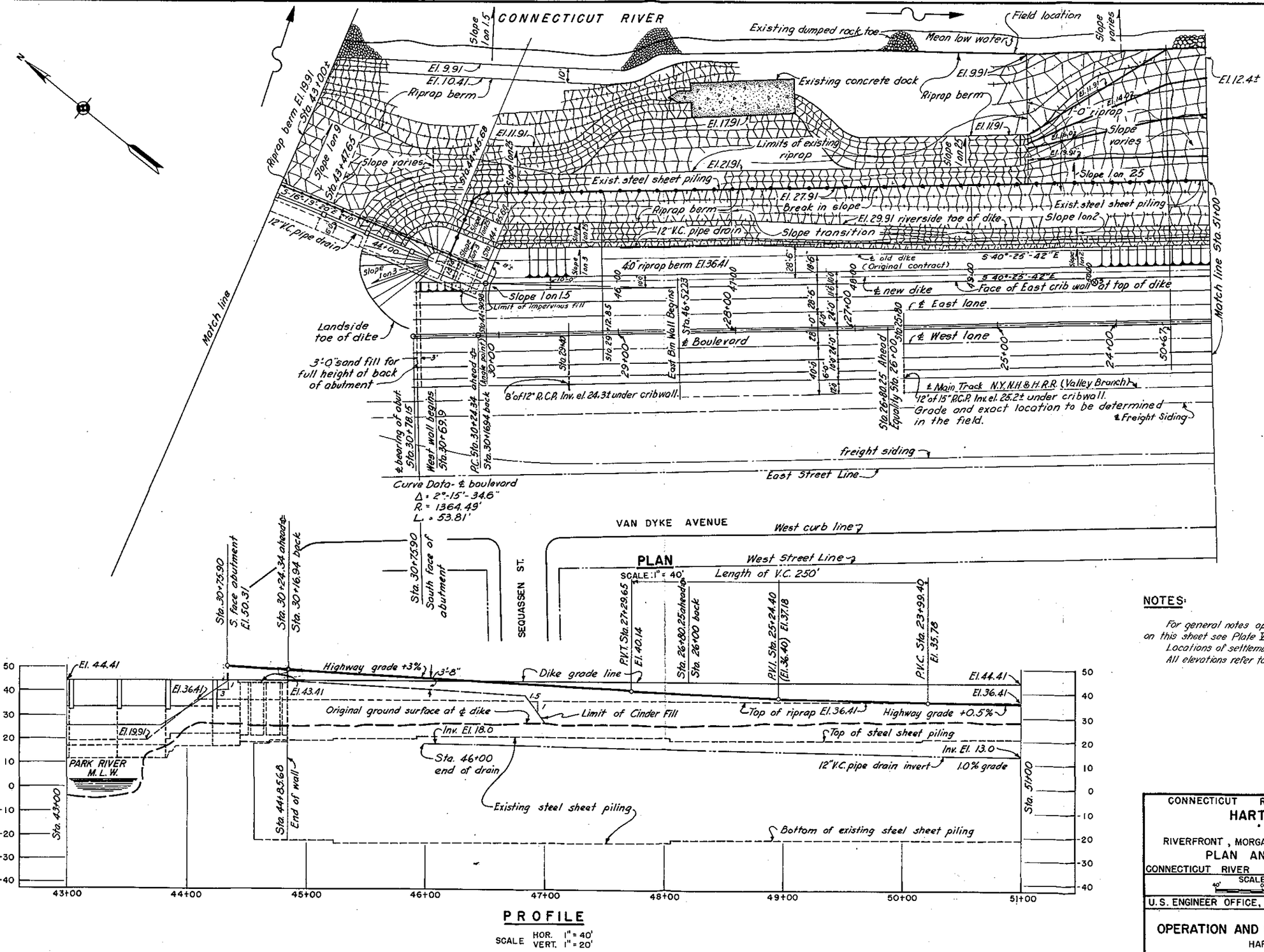
CONNECTICUT RIVER		CONNECTICUT
IN 137 SHEETS	SCALE: 1IN=10FT.	SHEET NO. 43A
U.S. ENGINEER OFFICE	PROVIDENCE, R.I.	DATE: FEB. 1943

OPERATION AND MAINTENANCE MANUAL
HARTFORD, CONN.

PLATE XIX A

WAR DEPARTMENT

CORPS OF ENGINEERS, U. S. ARMY



STATION COORDINATES		
STATION	NORTHINGS	EASTINGS
ANGLE STA. 44+90.98	N-48519.83	E-71726.48
℄ BEARING STA. 30+78.15	N-48538.17	E-71653.62
P.C. STA. 30+24.34	N-48497.91	E-71689.31

NOTES:

For general notes applying to details shown on this sheet see Plate VI.
Locations of settlement gages marked ⊕
All elevations refer to Mean Sea Level Datum.

CONNECTICUT RIVER FLOOD CONTROL

HARTFORD DIKE

RIVERFRONT, MORGAN STREET TO STA. 97+05

PLAN AND PROFILE NO. 6

CONNECTICUT RIVER — CONNECTICUT

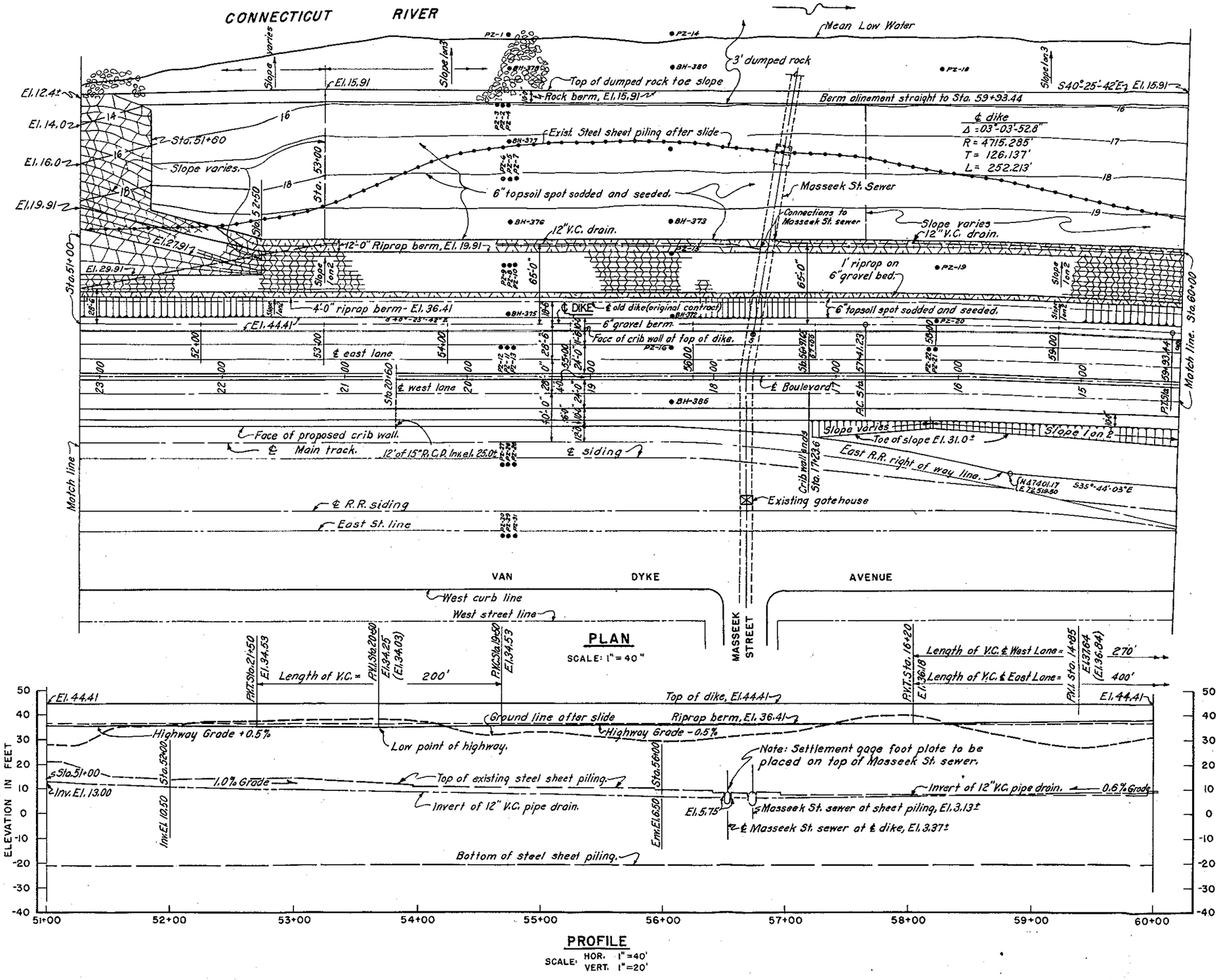
SCALE: 1 IN. = 40 FT.

U.S. ENGINEER OFFICE, PROVIDENCE, R.I., MARCH, 1942

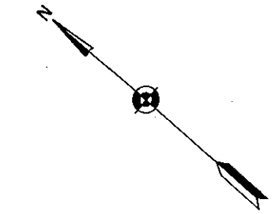
OPERATION AND MAINTENANCE MANUAL

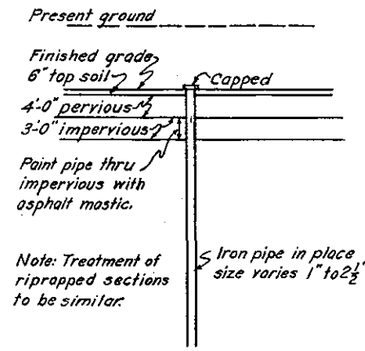
HARTFORD, CONN.

PLATE XX



STATION COORDINATES		
STATION	NORTHINGS	EASTINGS
P.C. Sta. 57+41.23	N 47568.11	E 72 537.27
P.T. Sta. 59+93.44	N 47371.84	E 72695.62





TYPICAL TREATMENT AT EXISTING PIEZOMETERS

NOT TO SCALE

NOTES:

For general notes see Plate VI.
•(PZ) or •(BH) location of piezometers.
⊗ Settlement gage.

CONNECTICUT RIVER FLOOD CONTROL

HARTFORD DIKE

RIVERFRONT, MORGAN STREET TO STA. 97 + 05

PLAN AND PROFILE NO. 7

CONNECTICUT RIVER — CONNECTICUT

SCALE: 1 IN. = 40 FT.

U. S. ENGINEER OFFICE, PROVIDENCE, R.I., MARCH 1942

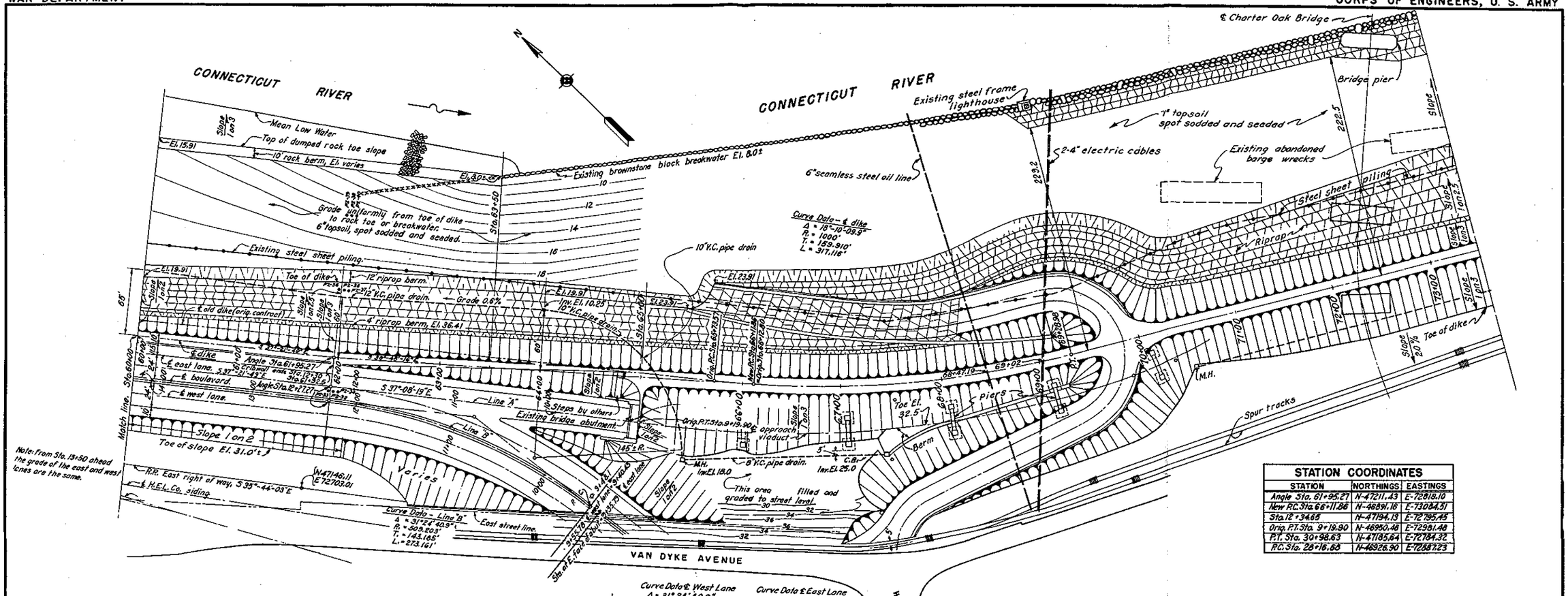
OPERATION AND MAINTENANCE MANUAL

HARTFORD, CONN.

PLATE XXI

WAR DEPARTMENT

CORPS OF ENGINEERS, U. S. ARMY

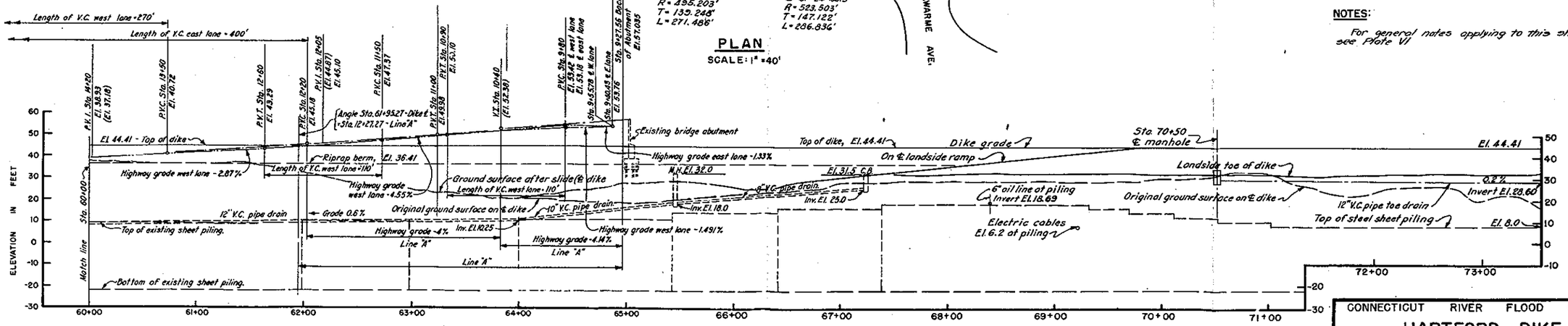


PLAN

SCALE: 1" = 40'

STATION COORDINATES		
STATION	NORTHINGS	EASTINGS
Angle Sta. 61+95.27	N-47211.43	E-72818.10
New P.C. Sta. 66+11.86	N-46891.16	E-73084.51
Sta. 12+34.65	N-47194.13	E-72795.15
Orig. P.T. Sta. 9+19.90	N-46950.48	E-72981.48
P.T. Sta. 30+98.63	N-47185.84	E-72784.32
P.C. Sta. 28+16.68	N-46926.90	E-72887.23

Note: From Sta. 13+50 ahead the grade of the east and west lines are the same.



PROFILE

SCALE: HOR. 1" = 40'
VERT. 1" = 20'

NOTES:

For general notes applying to this sheet, see Plate VI

CONNECTICUT RIVER FLOOD CONTROL

HARTFORD DIKE

PLAN AND PROFILE NO. 8

CONNECTICUT RIVER CONNECTICUT

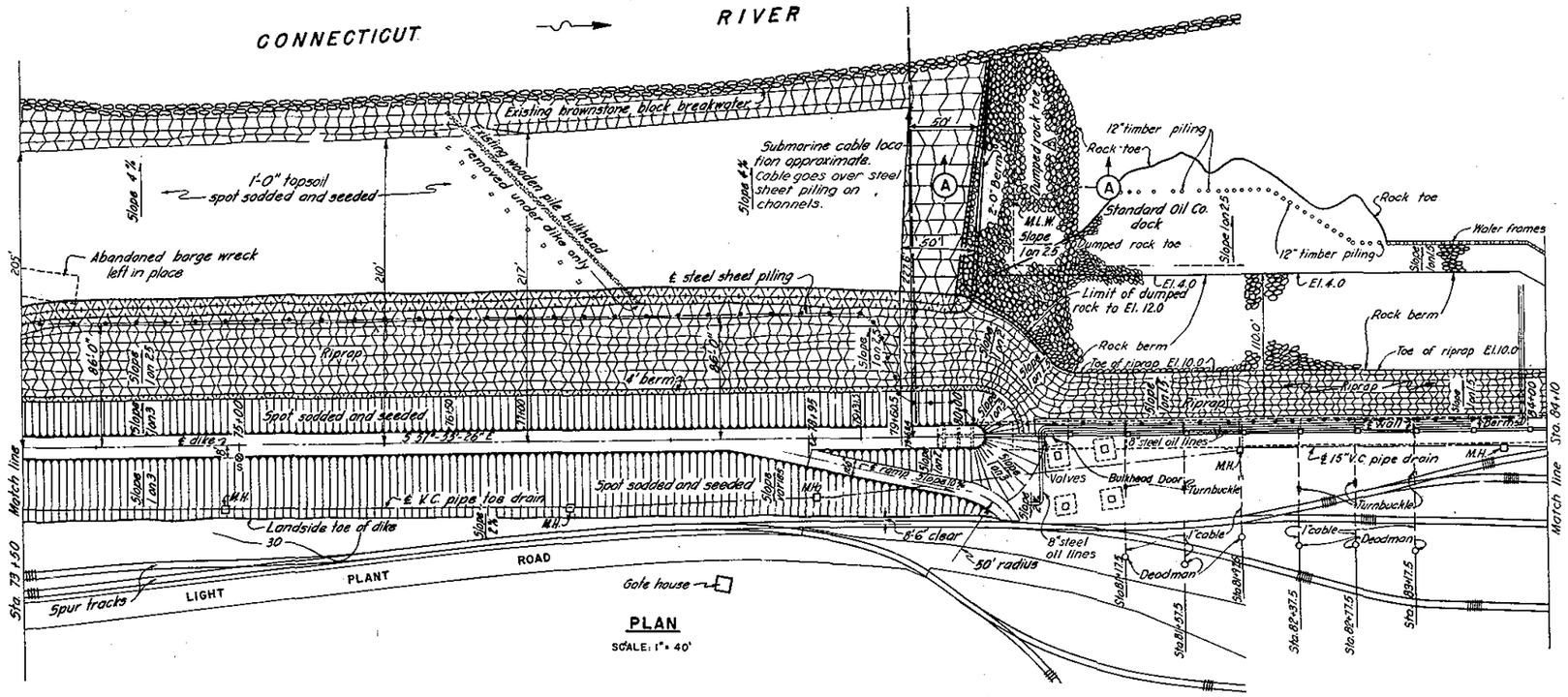
SCALE: 1 IN. = 40 FT.

U. S. ENGINEER OFFICE, PROVIDENCE, R.I.,

OPERATION AND MAINTENANCE MANUAL

HARTFORD, CONN.

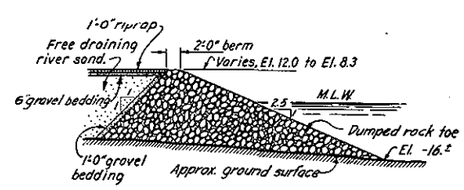
PLATE XXII



PLAN

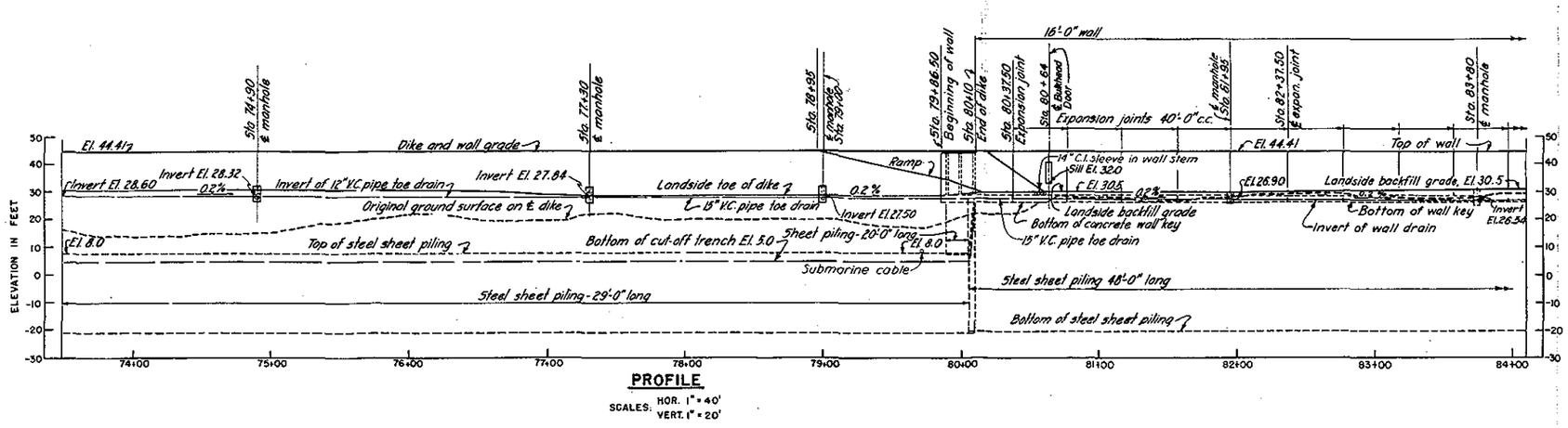
SCALE: 1" = 40'

ANCHORAGE SCHEDULE		
STATION	DISTANCE FROM ℄ DIKE TO TURNBUCKLE	DISTANCE FROM ℄ DIKE TO DEADMAN
81+17.5	35.25	85.35
81+57.5	38.75	90.95
81+97.5	31.75	72.05
82+37.5	38.75	78.05
82+77.5	34.75	77.65
83+17.5	28.75	82.35



SECTION A

SCALE: 1" = 20'



PROFILE

SCALES: HOR. 1" = 40'
VERT. 1" = 20'

NOTES

For general notes applying to this sheet see Plate VI

CONNECTICUT RIVER FLOOD CONTROL

HARTFORD DIKE

RIVERFRONT, MORGAN ST. TO STA. 97 + 05

PLAN AND PROFILE NO. 9

CONNECTICUT RIVER CONNECTICUT

SCALE: 1 IN. = 40 FT.

U.S. ENGINEER OFFICE, PROVIDENCE, R.I.,

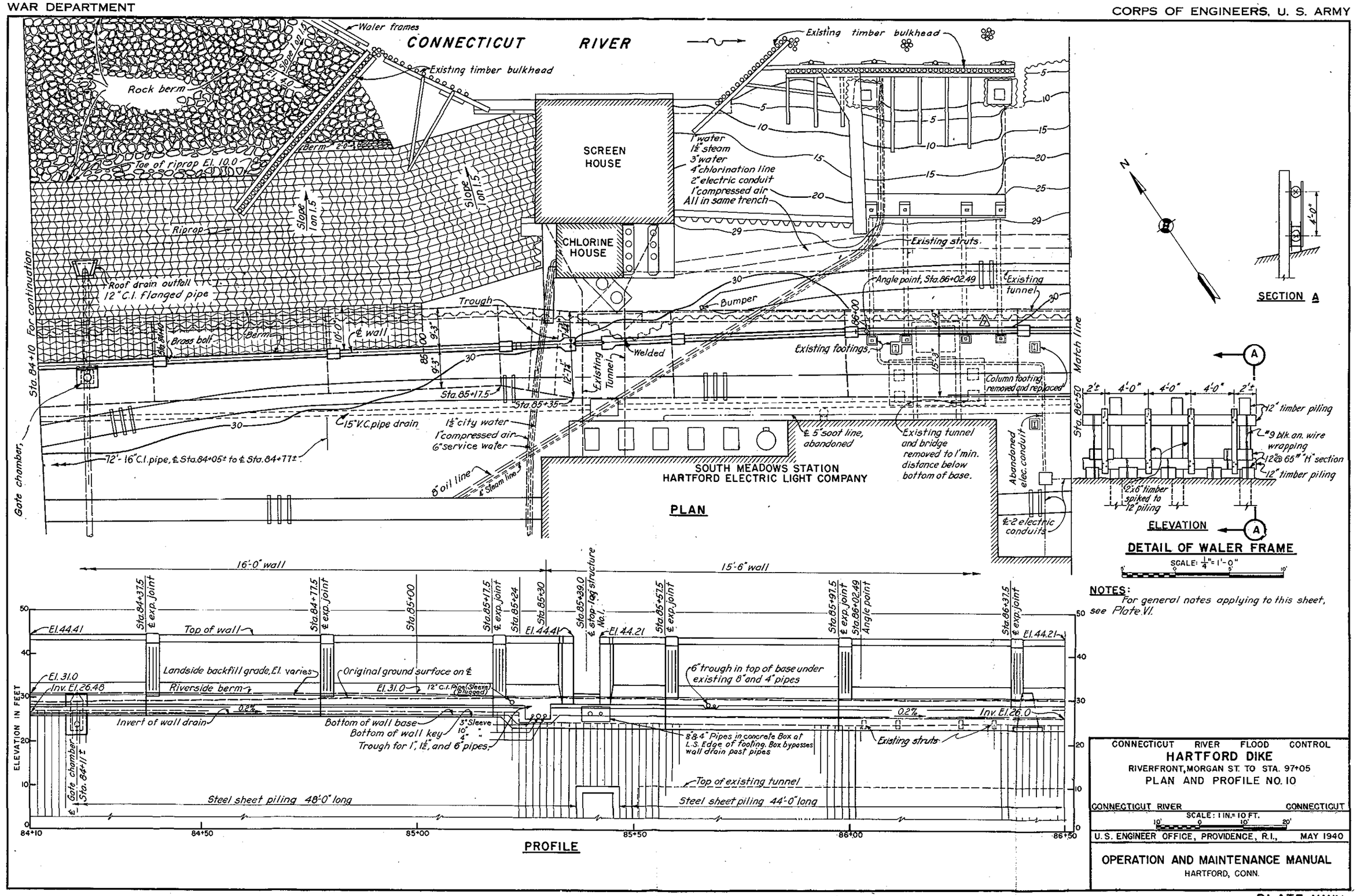
OPERATION AND MAINTENANCE MANUAL

HARTFORD, CONN.

PLATE XXIII

WAR DEPARTMENT

CORPS OF ENGINEERS, U. S. ARMY



NOTES:
For general notes applying to this sheet, see Plate VI.

CONNECTICUT RIVER FLOOD CONTROL
HARTFORD DIKE
RIVERFRONT, MORGAN ST. TO STA. 97+05
PLAN AND PROFILE NO. 10

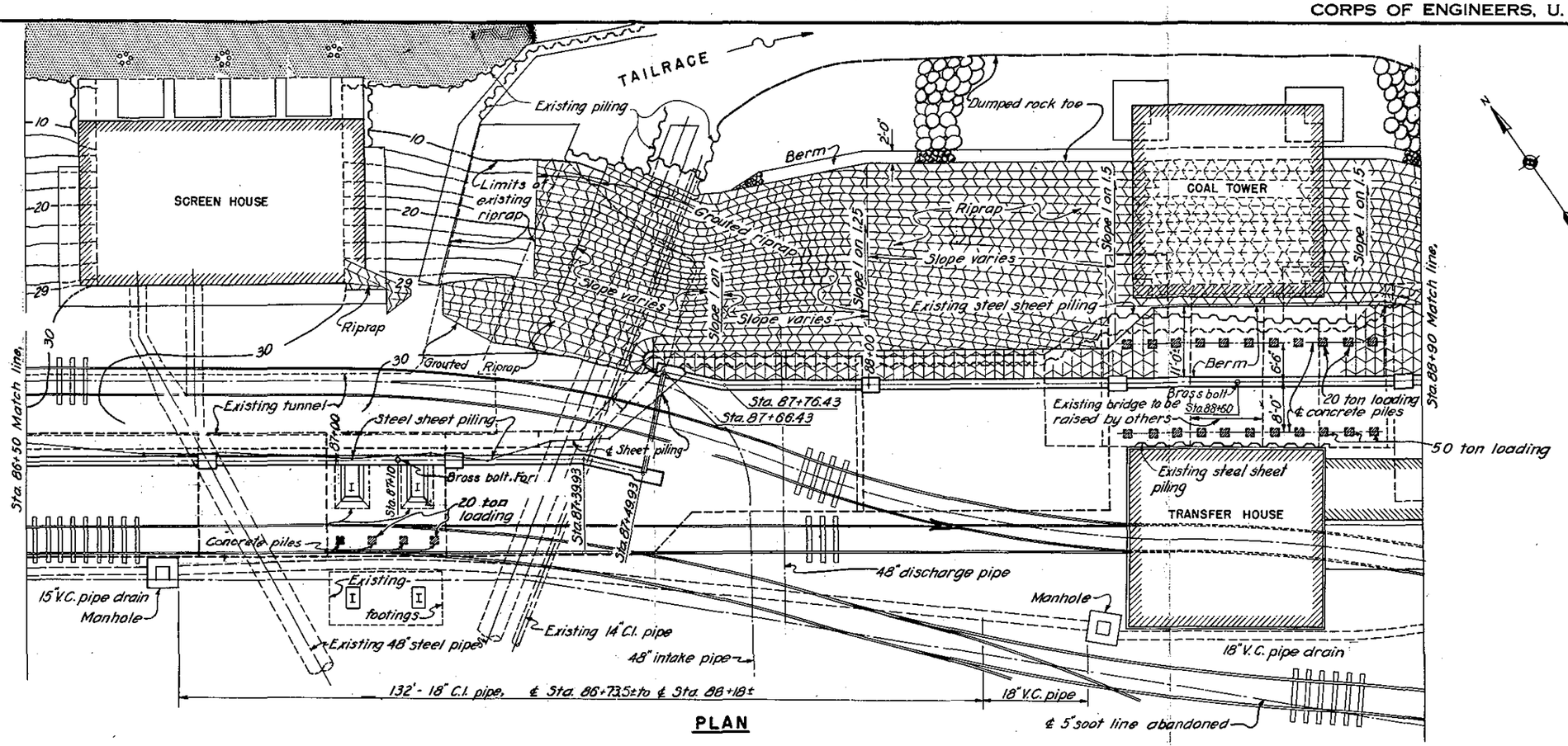
CONNECTICUT RIVER — CONNECTICUT

SCALE: 1 IN. = 10 FT.

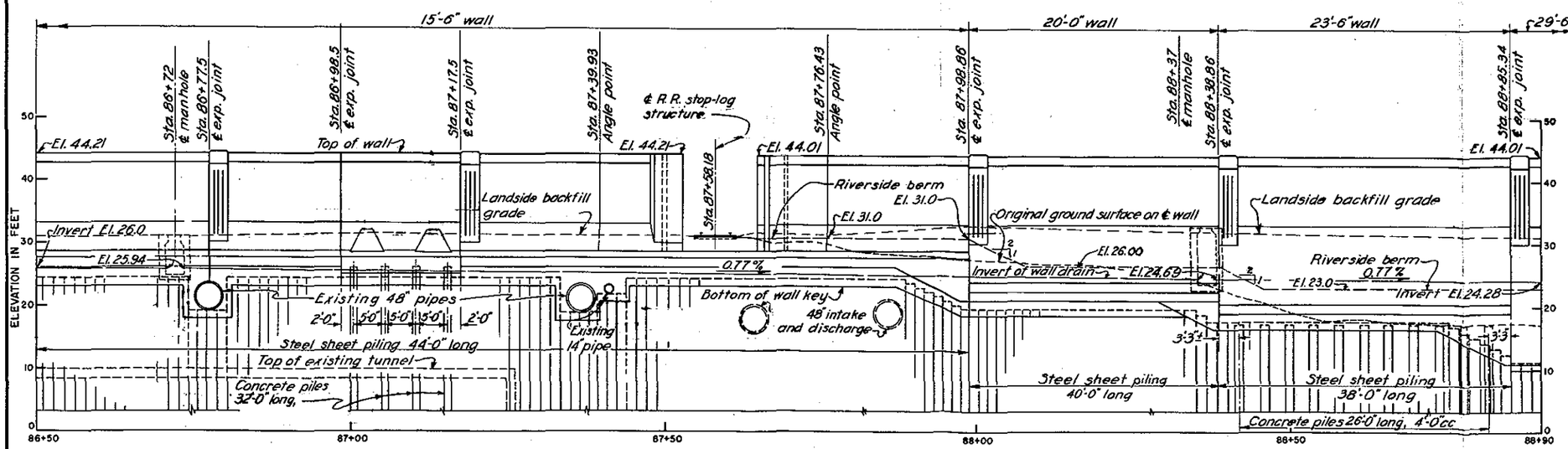
U. S. ENGINEER OFFICE, PROVIDENCE, R.I., MAY 1940

OPERATION AND MAINTENANCE MANUAL
HARTFORD, CONN.

PLATE XXIV



PLAN



PROFILE

NOTES

For general notes applying to this sheet, see Plate VI.

CONNECTICUT RIVER FLOOD CONTROL

HARTFORD DIKE

RIVERFRONT, MORGAN ST. TO STA. 97+05

PLAN AND PROFILE NO. II

CONNECTICUT RIVER — CONNECTICUT

SCALE 1 IN. = 10 FT.

U.S. ENGINEER OFFICE, PROVIDENCE, R.I., MAY 1940

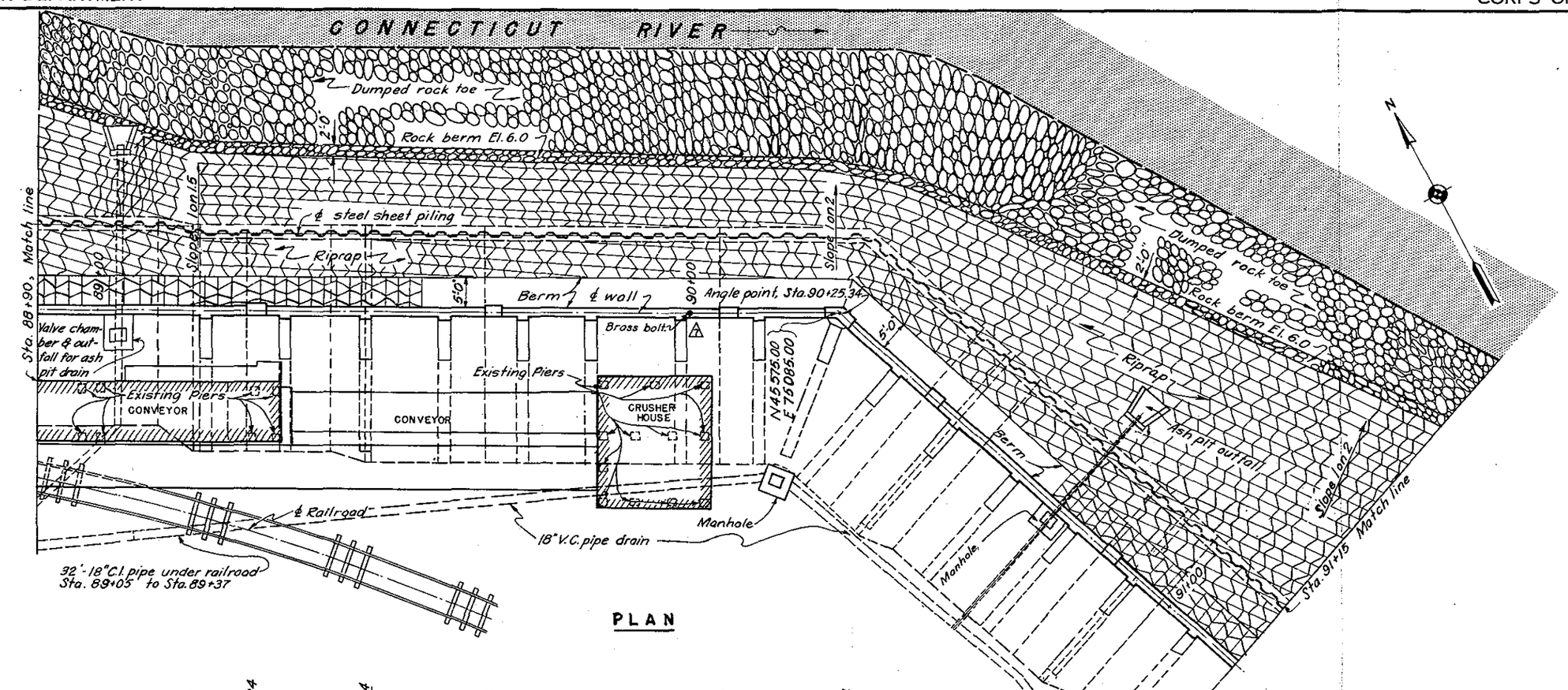
OPERATION AND MAINTENANCE MANUAL

HARTFORD, CONN.

PLATE XXV

WAR DEPARTMENT

CORPS OF ENGINEERS, U. S. ARMY



NOTES

For general notes applying to this sheet see Plate VI.

CONNECTICUT RIVER FLOOD CONTROL

HARTFORD DIKE

RIVERFRONT, MORGAN ST. TO STA. 97+05

PLAN AND PROFILE NO. 12

CONNECTICUT RIVER CONNECTICUT

SCALE: 1 IN. = 10 FT.

10' 0 10' 20'

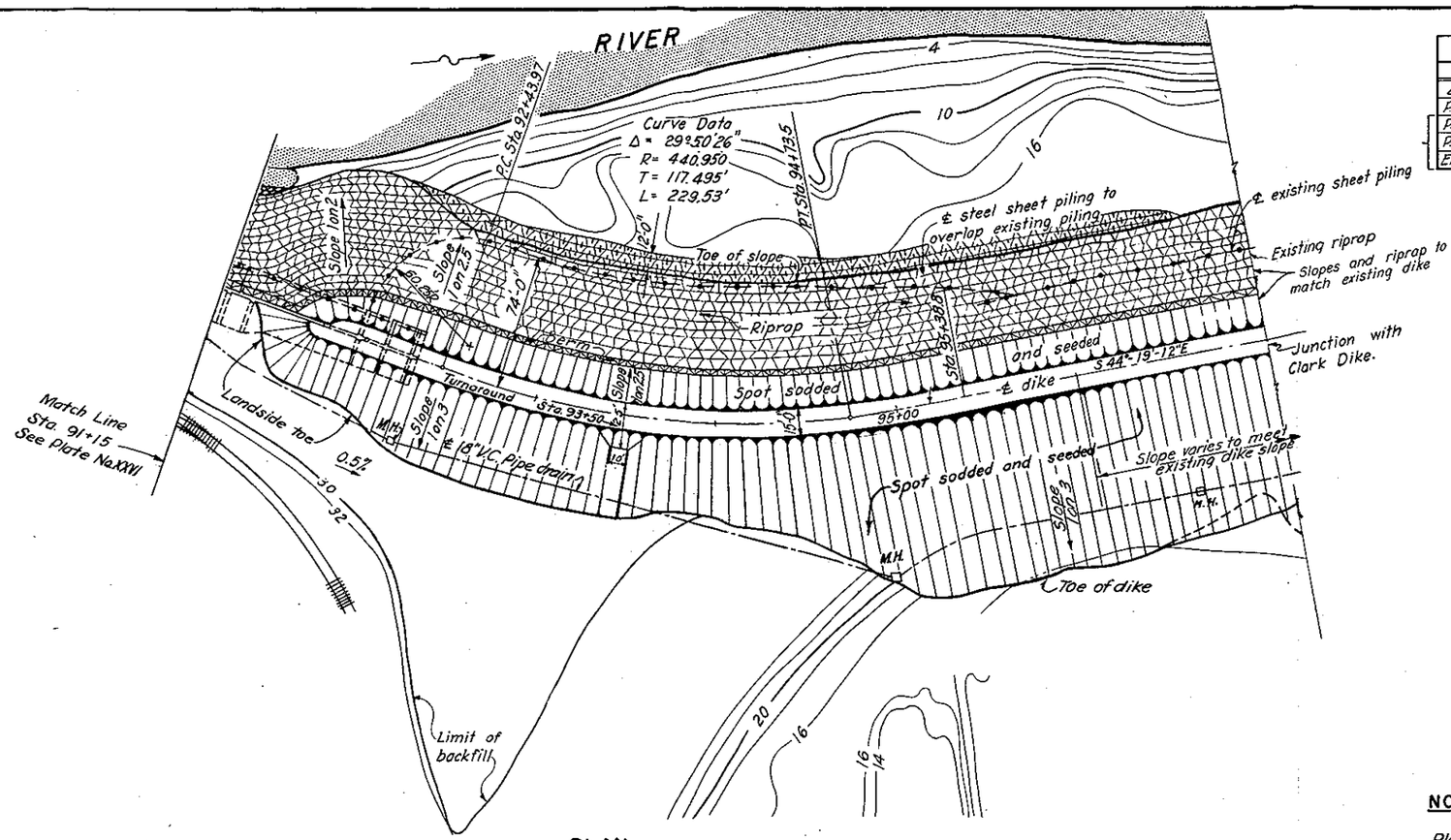
U.S. ENGINEER OFFICE, PROVIDENCE, R.I., MAY 1940

OPERATION AND MAINTENANCE MANUAL

HARTFORD, CONN.

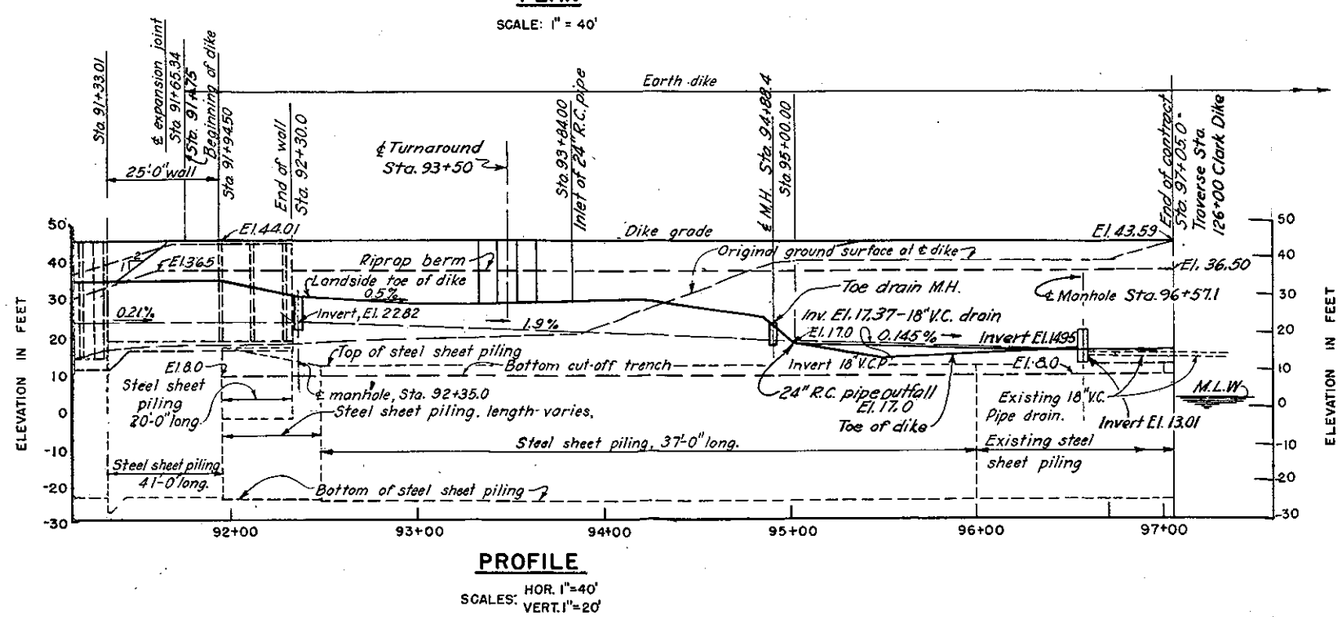
PLATE XXVI

STATION	COORDINATES	
STATION	NORTHINGS	EASTINGS
℄ Sta. 90+25.34	N-45575.00	E-75085.00
P.C. Sta. 92+43.97	N-45363.32	E-75169.04
P.I.	N-45249.56	E-75169.04
P.T. Sta 94+73.5	N-45165.50	E-75251.13
End Sta 97+05.0	N-44999.88	E-75412.87



PLAN

SCALE: 1" = 40'



PROFILE

SCALES: HOR. 1"=40'
VERT. 1"=20'

NOTES

For general notes applying to this sheet see Plate VI.

CONNECTICUT RIVER FLOOD CONTROL

HARTFORD DIKE

RIVERFRONT, MORGAN ST. TO STA. 97+05

PLAN AND PROFILE NO. 13

CONNECTICUT RIVER — CONNECTICUT

SCALE: 1 IN. = 40 FT.

40' 0 40' 80'

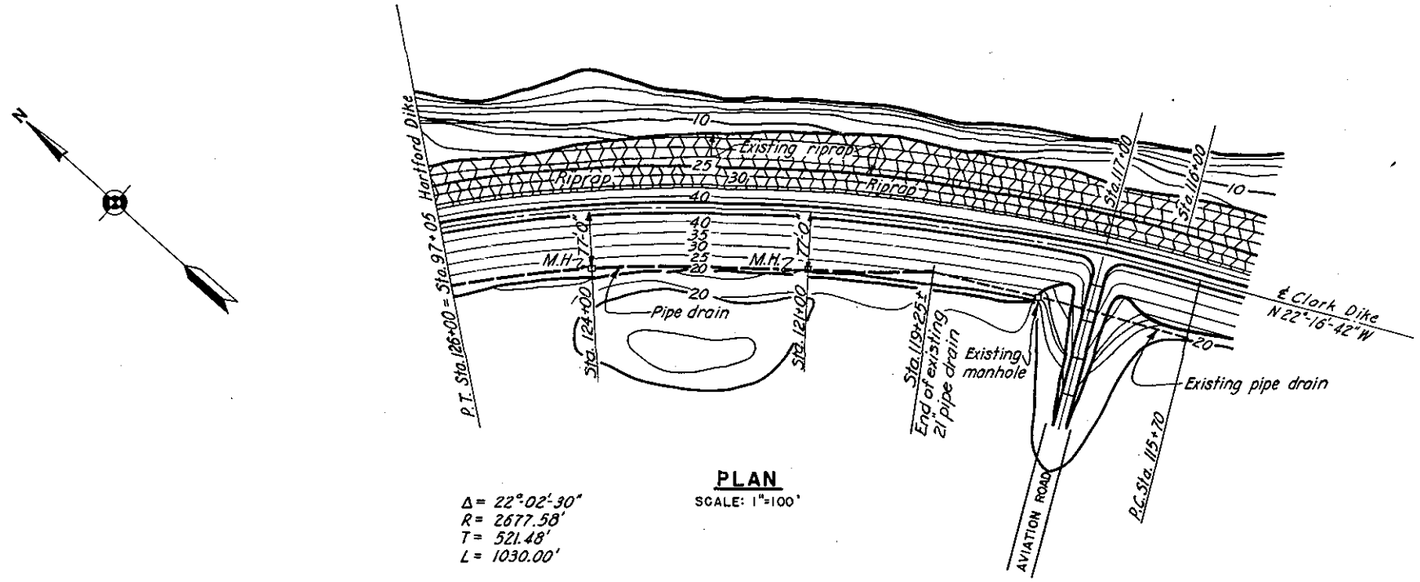
U.S. ENGINEER OFFICE, PROVIDENCE, R.I., MAY 1940

OPERATION AND MAINTENANCE MANUAL

HARTFORD, CONN.

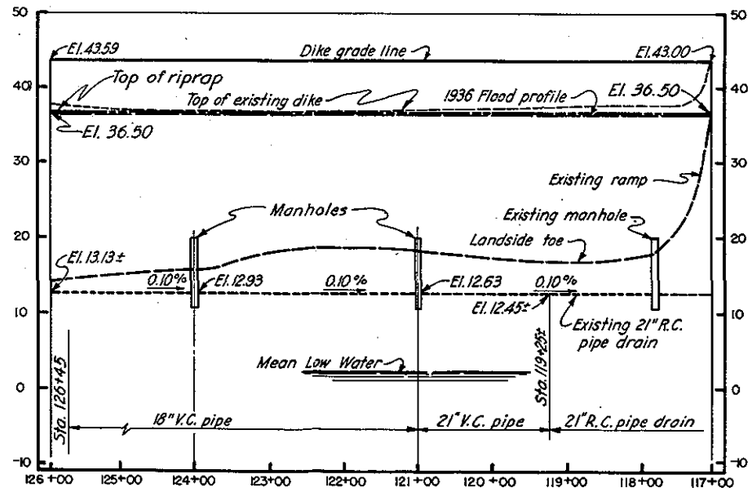
PLATE XXVII

CONNECTICUT RIVER



PLAN

SCALE: 1"=100'



PROFILE

SCALE: HOR. 1" = 10'
VERT. 1" = 100'

NOTES

For general notes applying to this sheet, see Plate VI

CONNECTICUT RIVER FLOOD CONTROL

CLARK DIKE

AVIATION ROAD — 900 FEET NORTH

PLAN AND PROFILE NO. 14

CONNECTICUT RIVER — CONNECTICUT

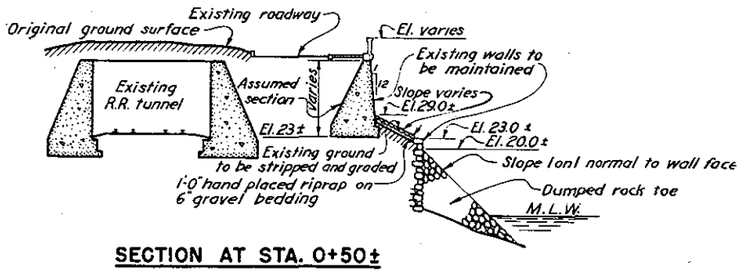
SCALE: 1 IN. = 100 FT.

U. S. ENGINEER OFFICE, PROVIDENCE, R. I., SEPT. 1939

OPERATION AND MAINTENANCE MANUAL

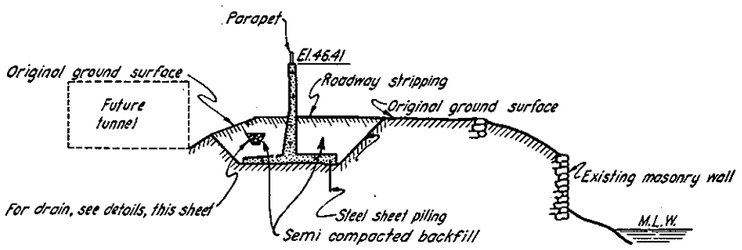
HARTFORD, CONN.

PLATE XXVIII



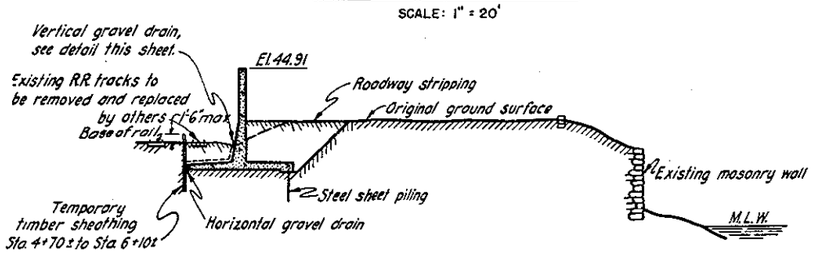
SECTION AT STA. 0+50±

SCALE: 1" = 20'



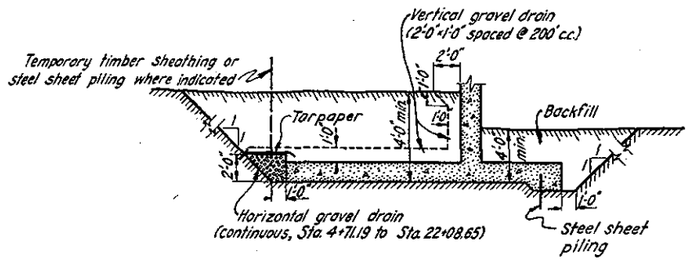
SECTION AT STA. 4+00

SCALE: 1" = 20'



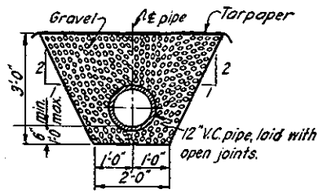
SECTION AT STA. 4+75

SCALE: 1" = 20'



TYPICAL EXCAVATION AND DRAIN TREATMENT

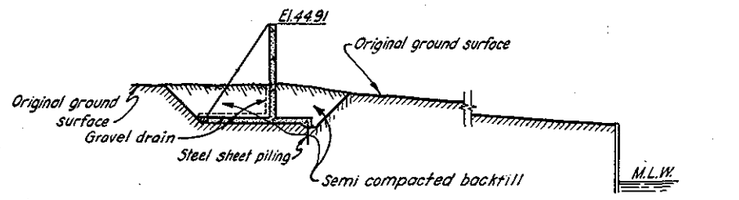
SCALE: 3/16" = 1'-0"



DETAIL OF GRAVEL DRAIN

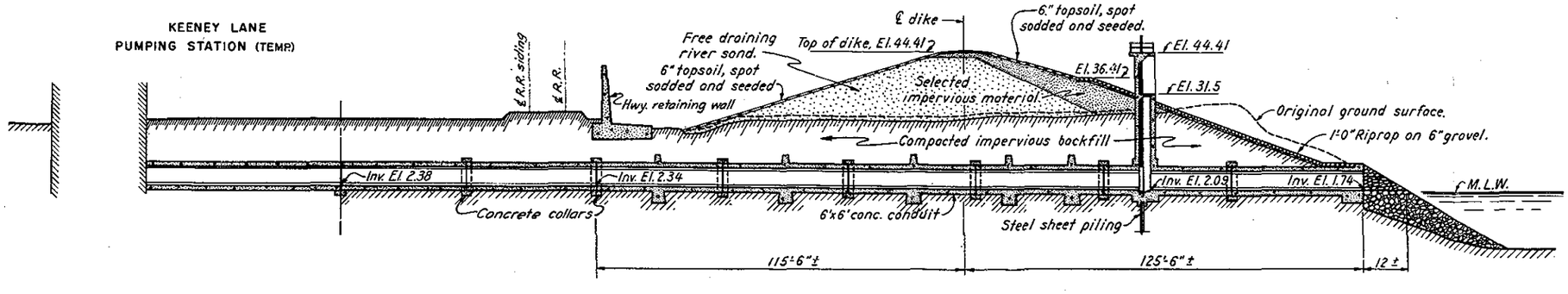
STA. 0+70± TO STA. 4+50

SCALE: 1/2" = 1'-0"



SECTION AT STA. 21+00

SCALE: 1" = 20'



PROFILE ALONG ℄ KEENEY LANE CONDUIT

STA. 26+80.52

NOTE

Elevations refer to Mean Sea Level Datum.

CONNECTICUT RIVER FLOOD CONTROL

HARTFORD DIKE

TYPICAL GROSS SECTIONS NO. I

CONNECTICUT RIVER — CONNECTICUT

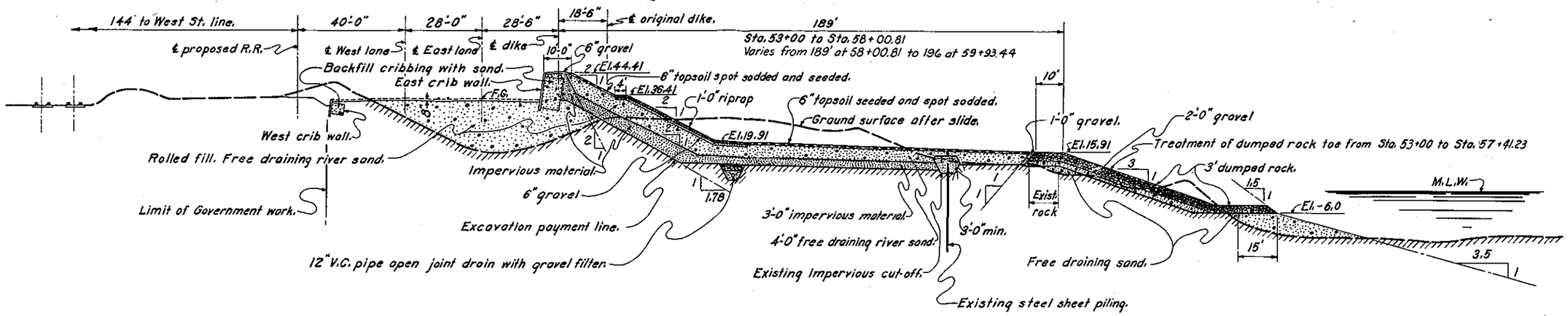
SCALE AS SHOWN

U. S. ENGINEER OFFICE, PROVIDENCE, R.I. 1945

OPERATION AND MAINTENANCE MANUAL

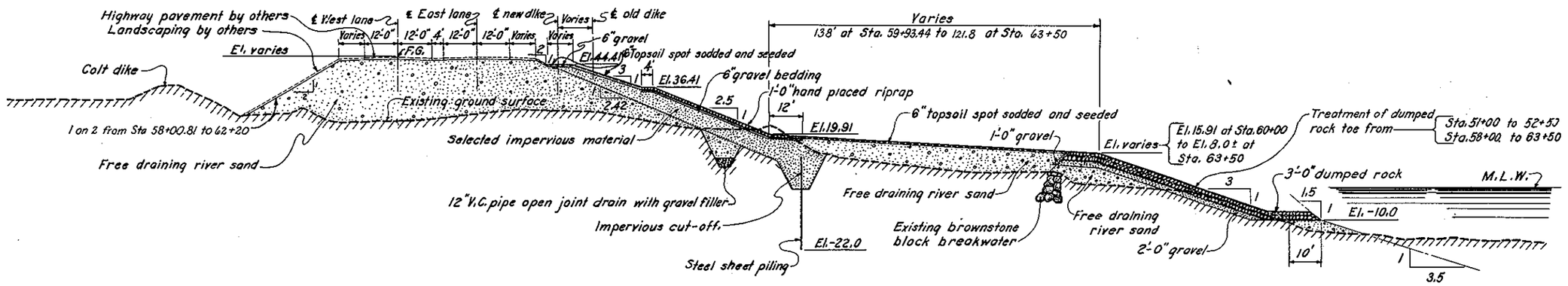
HARTFORD, CONN.

PLATE XXIX

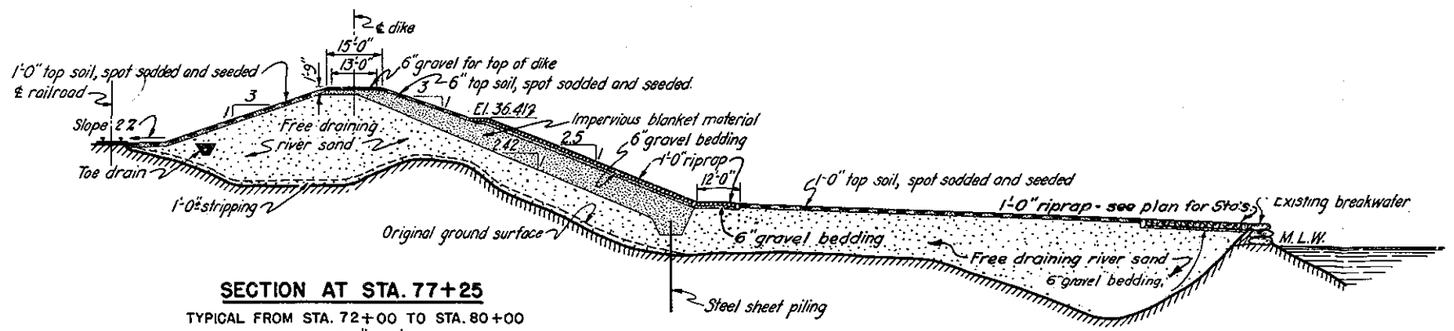


SECTION AT STA. 56 + 00

SCALE 1" = 20'



SECTION AT STA. 62 + 50



SECTION AT STA. 77+25

TYPICAL FROM STA. 72+00 TO STA. 80+00

SCALE: 1"=20'

NOTE:

Elevations refer to Mean Sea Level Datum.

CONNECTICUT RIVER FLOOD CONTROL

HARTFORD DIKE

TYPICAL CROSS SECTIONS NO. 3

CONNECTICUT RIVER — CONNECTICUT

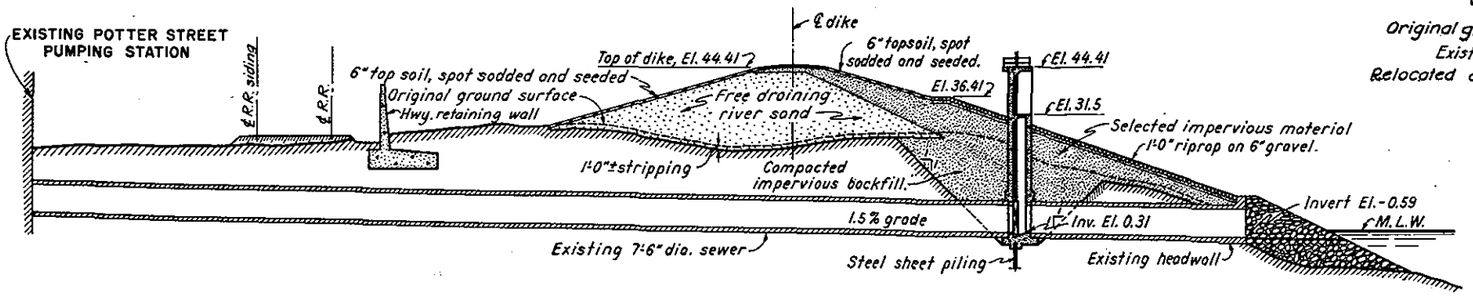
SCALE 1" = 20'

U. S. ENGINEER OFFICE, PROVIDENCE, R.I. 1945

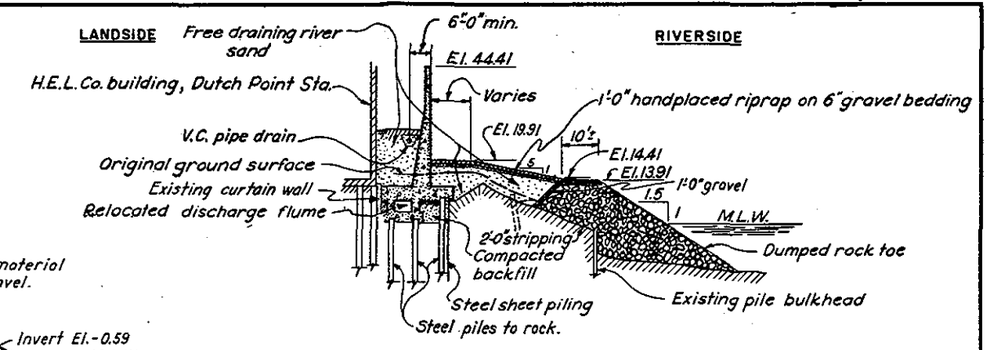
OPERATION AND MAINTENANCE MANUAL

HARTFORD, CONN.

PLATE XXXI

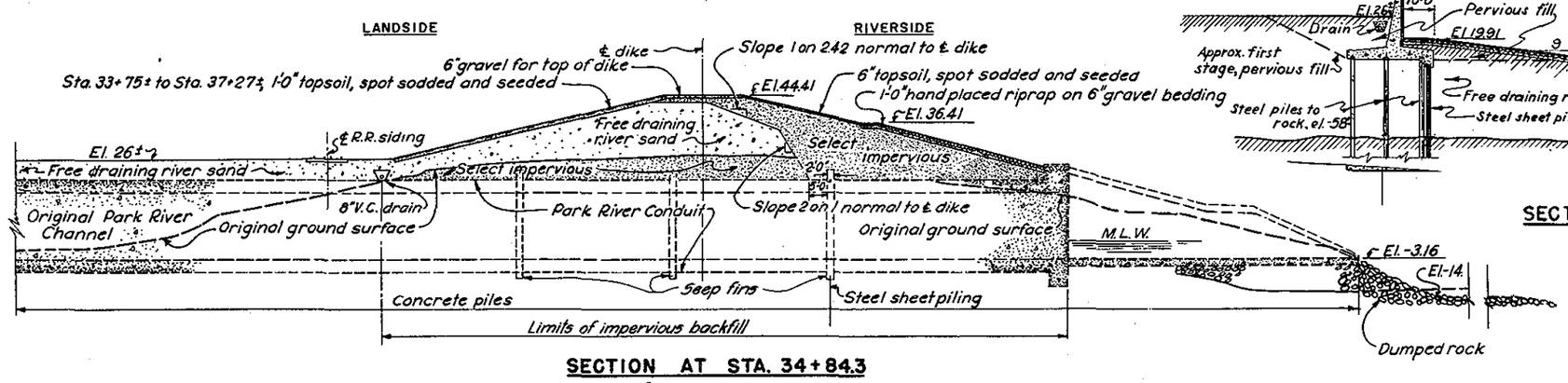


PROFILE ALONG ℄ POTTER STREET CONDUIT



SECTION AT STA. 39 + 62

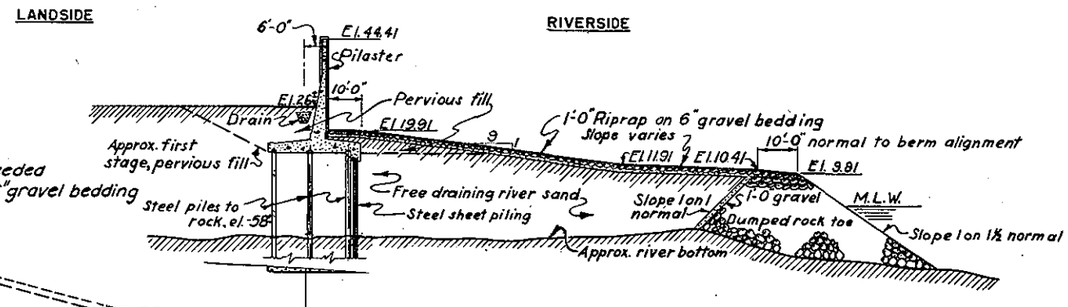
SCALE: 1"=20'



SECTION AT STA. 34+84.3

(ALONG ℄ PARK RIVER CONDUIT)

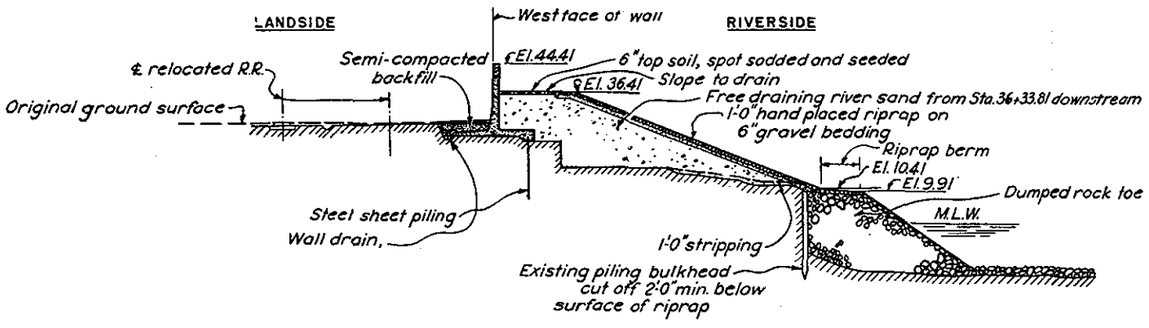
SCALE: 1"=20'



SECTION AT STA. 43+15 ±

PARK RIVER CHANNEL

SCALE: 1" = 20'



SECTION AT STA. 37+00

SCALE: 1"=20'

Impervious backfill to Sta. 36+33.81

NOTE:

1. Elevations refer to Mean Sea Level Datum.

CONNECTICUT RIVER FLOOD CONTROL

HARTFORD DIKE

TYPICAL CROSS SECTIONS NO. 2

CONNECTICUT RIVER — CONNECTICUT

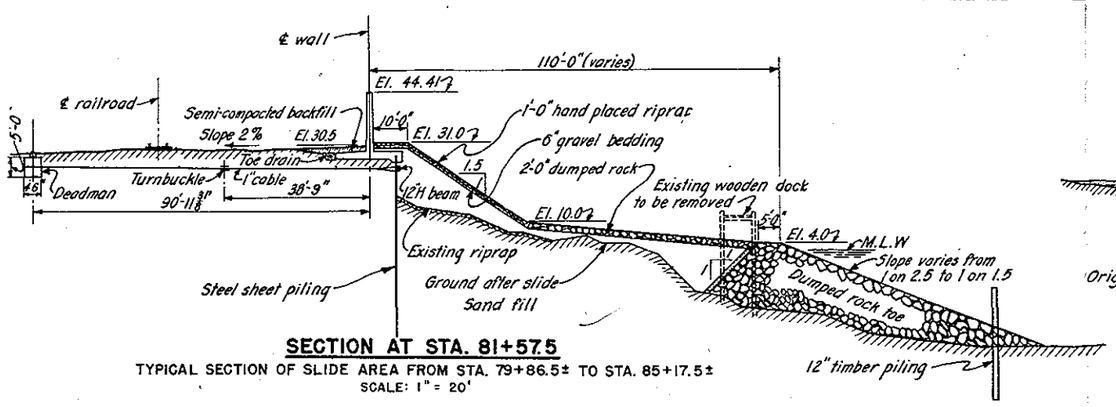
SCALE 1" = 20'

U.S. ENGINEER OFFICE, PROVIDENCE, R.I.,

OPERATION AND MAINTENANCE MANUAL

HARTFORD, MASS.

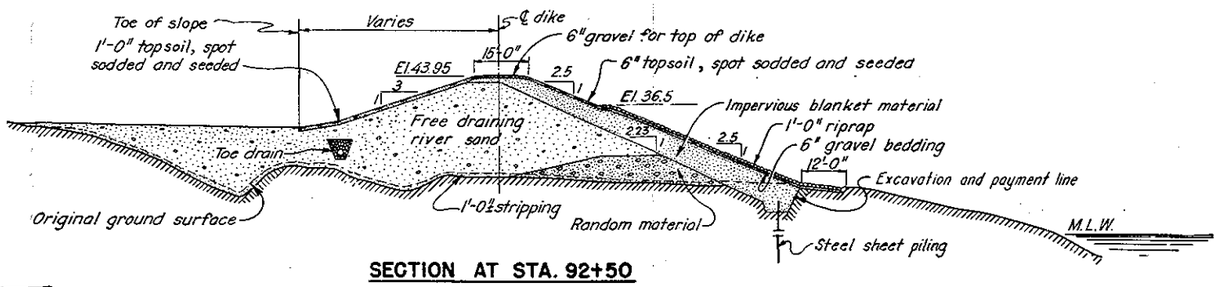
PLATE XXX



SECTION AT STA. 81+57.5

TYPICAL SECTION OF SLIDE AREA FROM STA. 79+86.5± TO STA. 85+17.5±

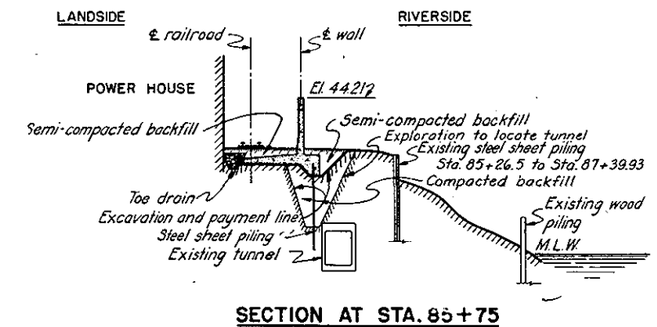
SCALE: 1" = 20'



SECTION AT STA. 92+50

TYPICAL FROM STA. 91+75.0 TO STA. 94+30±

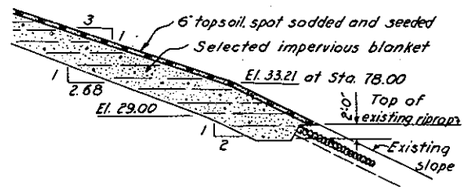
SCALE: 1" = 20'



SECTION AT STA. 85+75

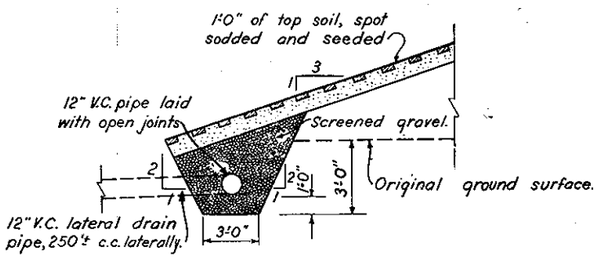
TYPICAL FROM STA. 85 +39 TO STA. 88+00

SCALE: 1" = 20'



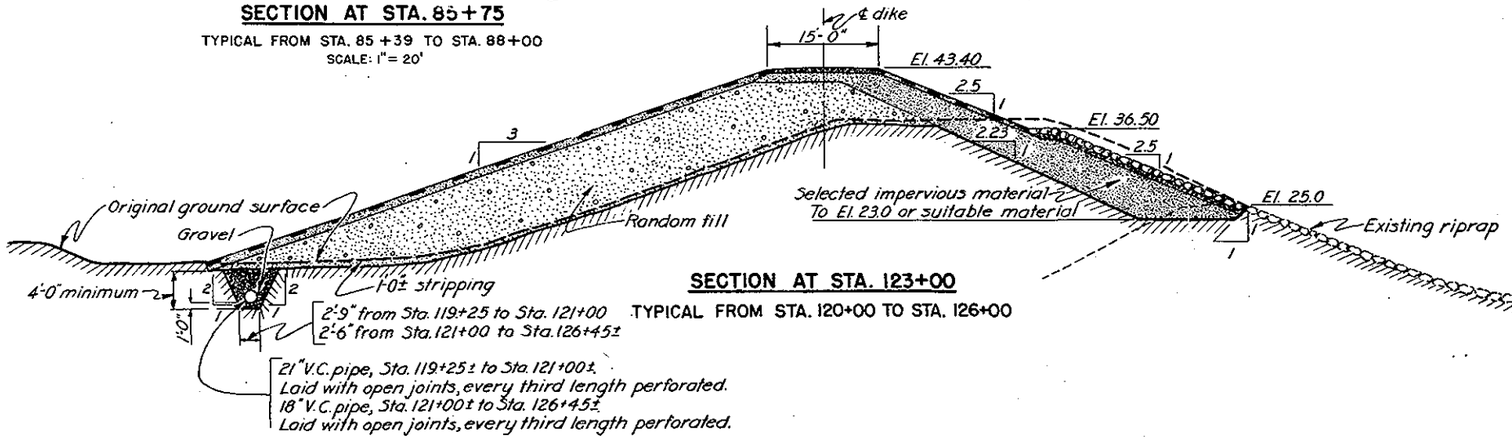
DETAIL OF SLOPE TREATMENT WHERE RIPRAP IS BURIED

SCALE: 1 IN. = 10 FT.



DETAIL OF V.C. PIPE TOE DRAIN

SCALE: 1/4" = 1'-0"



SECTION AT STA. 123+00 TYPICAL FROM STA. 120+00 TO STA. 126+00

NOTE

Elevations refer to Mean Sea Level Datum.

CONNECTICUT RIVER FLOOD CONTROL

HARTFORD DIKE

TYPICAL CROSS SECTIONS NO. 4

CONNECTICUT RIVER — CONNECTICUT

SCALE AS SHOWN

U. S. ENGINEER OFFICE, PROVIDENCE, R.I.,

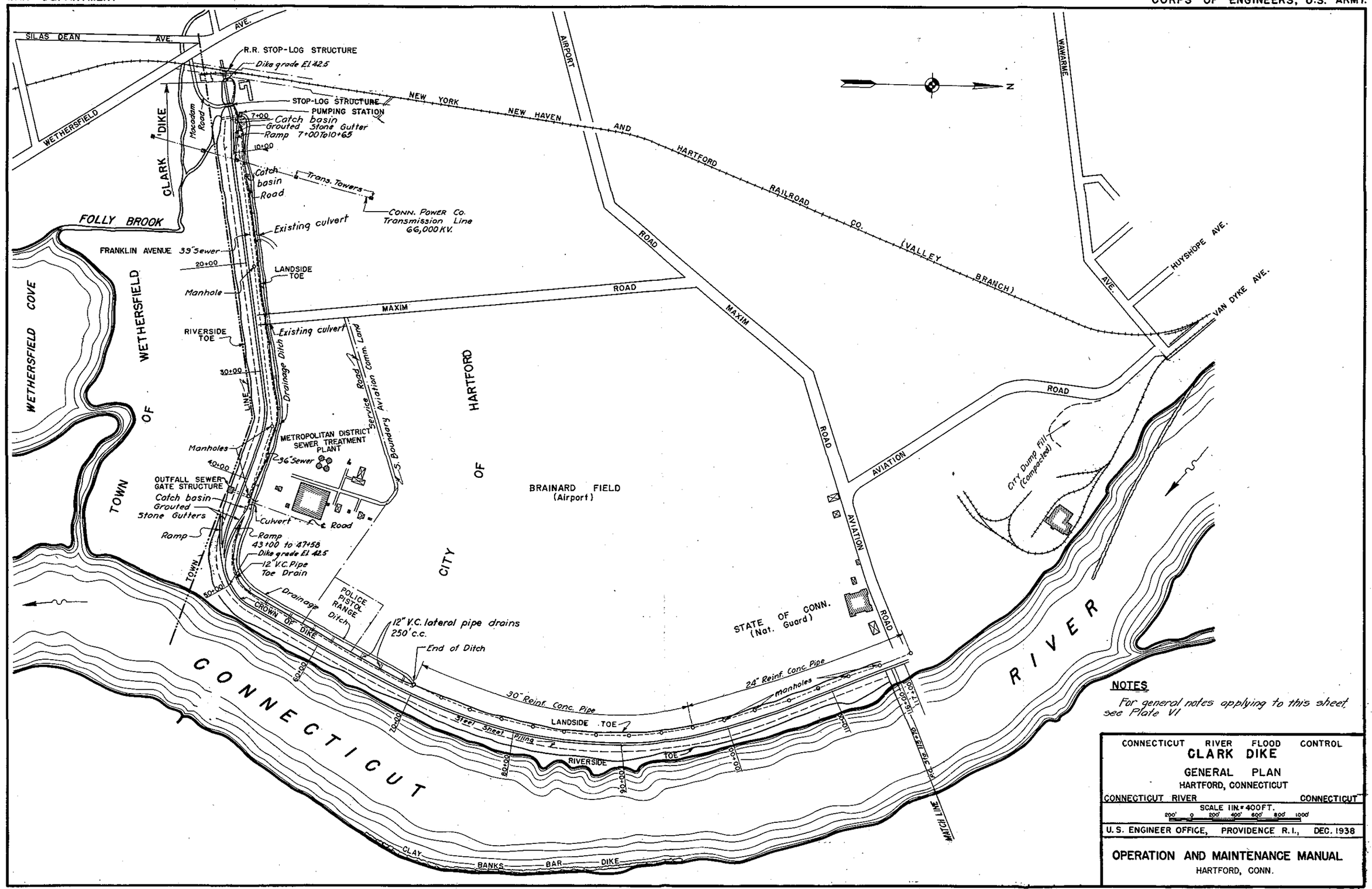
OPERATION AND MAINTENANCE MANUAL

HARTFORD, CONN.

PLATE XXXII

WAR DEPARTMENT

CORPS OF ENGINEERS, U.S. ARMY.



NOTES

For general notes applying to this sheet see Plate VI

CONNECTICUT RIVER FLOOD CONTROL

CLARK DIKE

GENERAL PLAN

HARTFORD, CONNECTICUT

CONNECTICUT RIVER — CONNECTICUT

SCALE 1 IN. = 400 FT.

200' 0 200' 400' 600' 800' 1000'

U.S. ENGINEER OFFICE, PROVIDENCE R.I., DEC. 1938

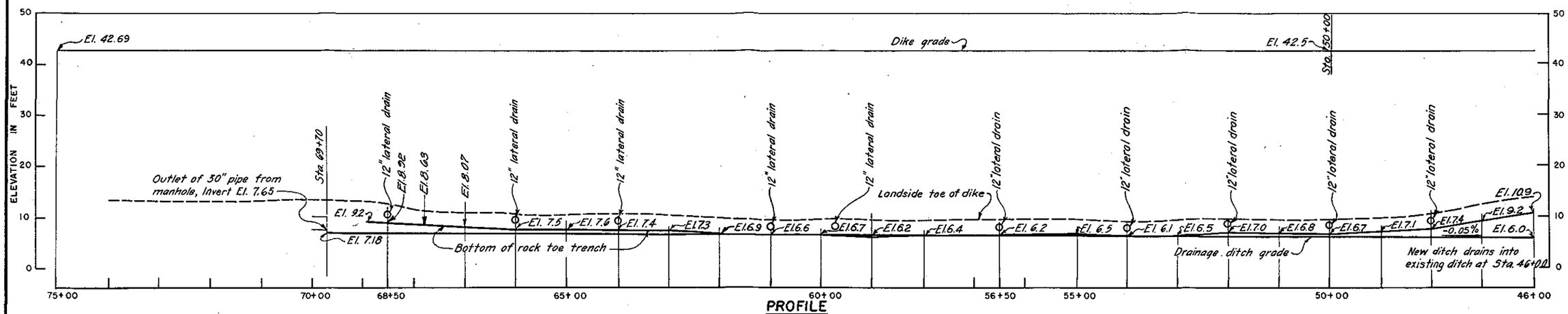
OPERATION AND MAINTENANCE MANUAL

HARTFORD, CONN.

PLATE XXXIII

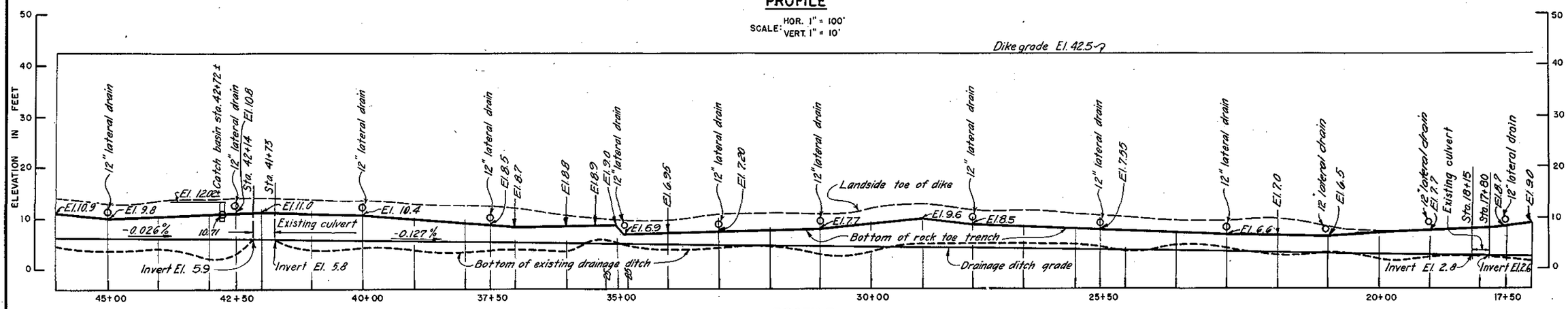
WAR DEPARTMENT

CORPS OF ENGINEERS, U.S. ARMY



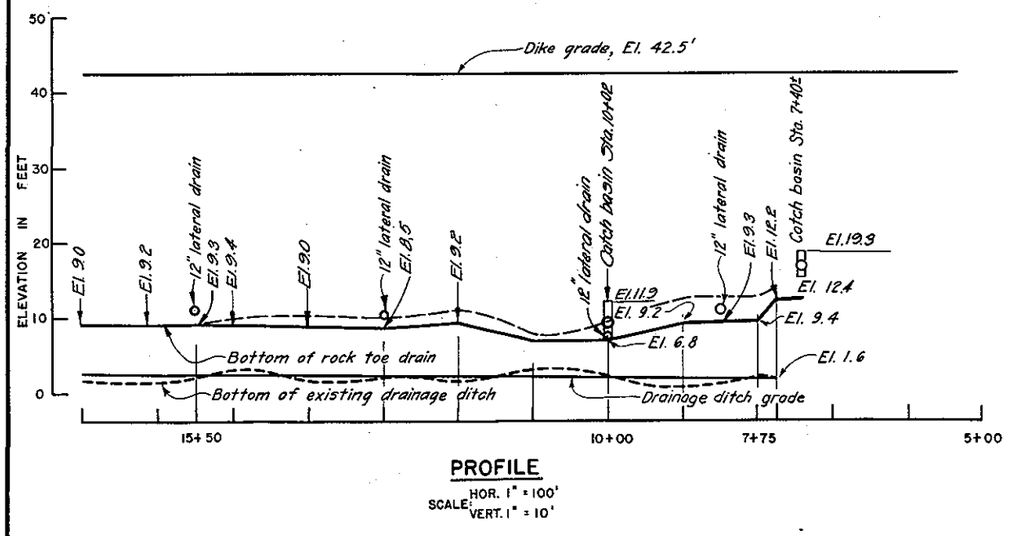
PROFILE

SCALE: HOR. 1" = 100'
VERT. 1" = 10'



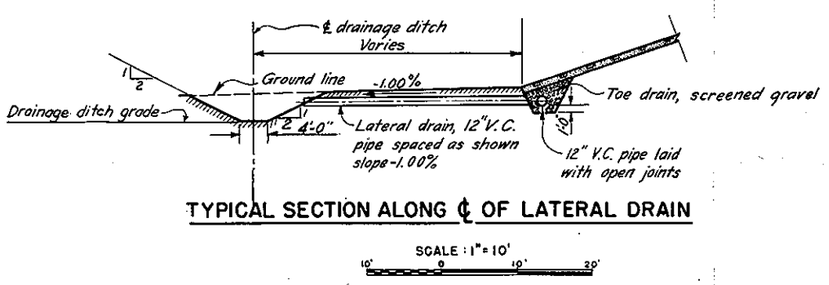
PROFILE

SCALE: HOR. 1" = 100'
VERT. 1" = 10'



PROFILE

SCALE: HOR. 1" = 100'
VERT. 1" = 10'



TYPICAL SECTION ALONG ℄ OF LATERAL DRAIN

SCALE: 1" = 10'

NOTES:

For general notes applying to this sheet, see Plate VI

CONNECTICUT RIVER FLOOD CONTROL

CLARK DIKE

TOE DRAINAGE DETAILS

HARTFORD, CONNECTICUT

CONNECTICUT RIVER — CONNECTICUT

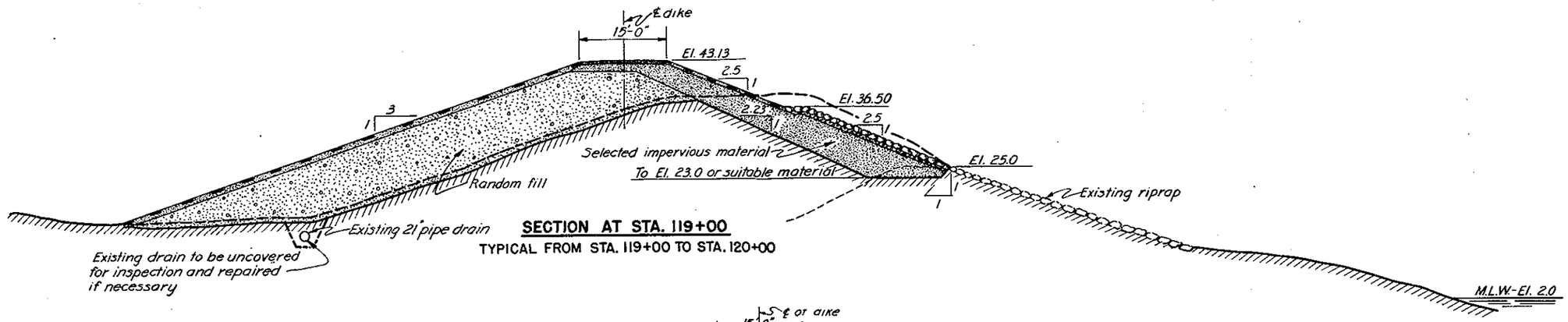
SCALE: 1 IN. = 100 FT.

U.S. ENGINEER OFFICE PROVIDENCE, R.I., MARCH, 1939

OPERATION AND MAINTENANCE MANUAL

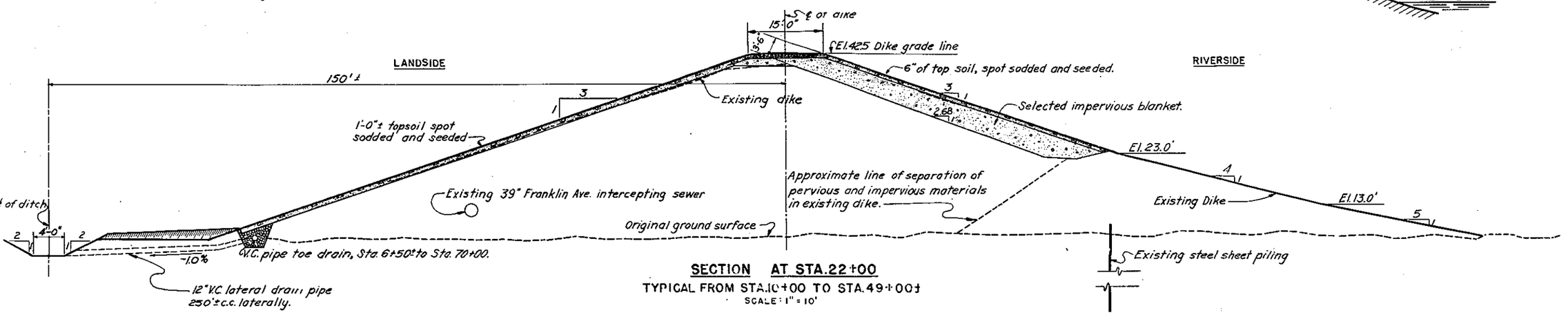
HARTFORD, CONN.

PLATE XXXIV



SECTION AT STA. 119+00

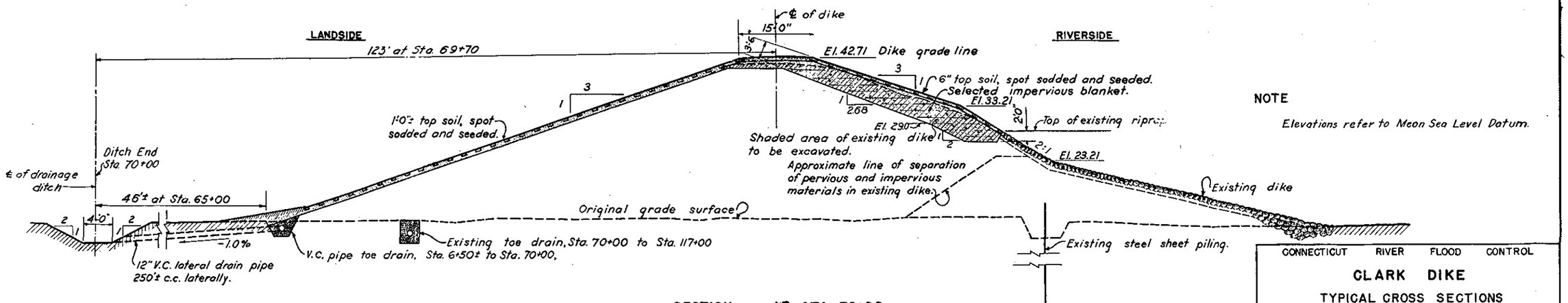
TYPICAL FROM STA. 119+00 TO STA. 120+00



SECTION AT STA. 22+00

TYPICAL FROM STA. 10+00 TO STA. 49+00±

SCALE: 1" = 10'



SECTION AT STA. 78+00

TYPICAL FROM STA. 65+00 TO STA. 78+00

SCALE: 1 IN. = 10 FT.

NOTE

Elevations refer to Mean Sea Level Datum.

CONNECTICUT RIVER FLOOD CONTROL

CLARK DIKE

TYPICAL CROSS SECTIONS

CONNECTICUT RIVER — CONNECTICUT

SCALE 1" = 10'

U. S. ENGINEER OFFICE, PROVIDENCE, R.I. 1945

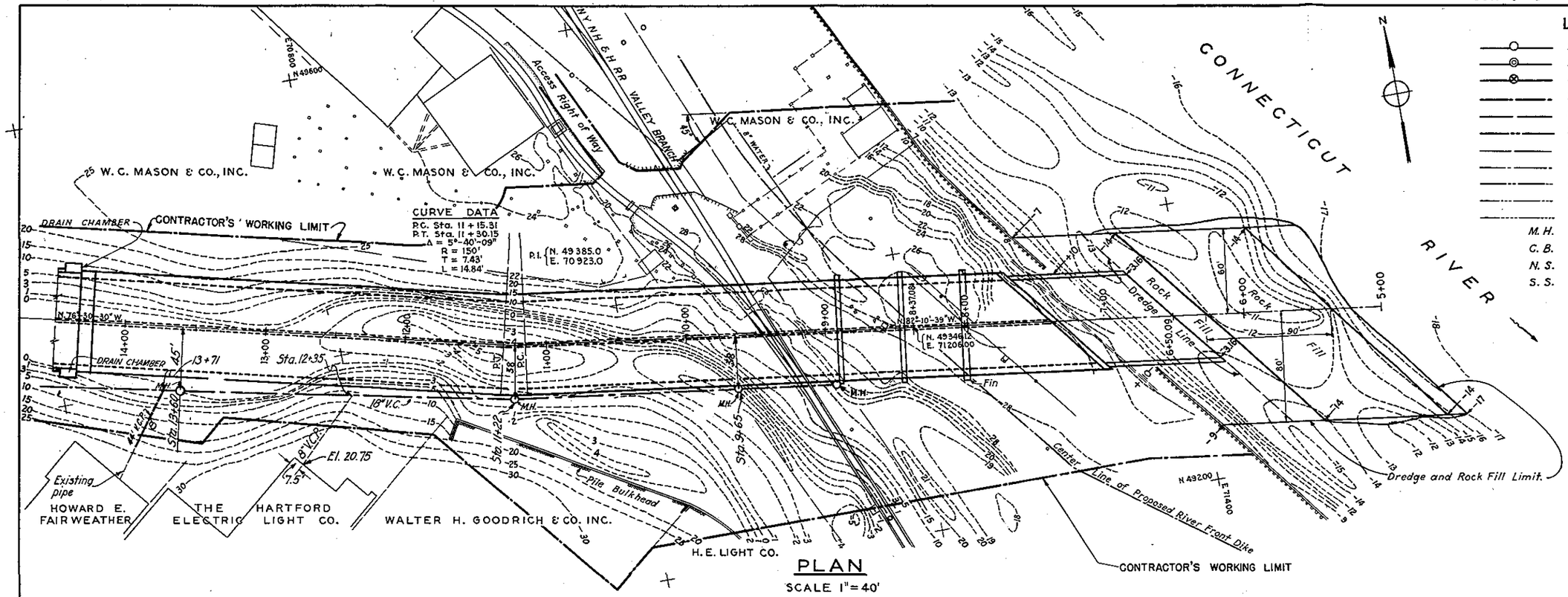
OPERATION AND MAINTENANCE MANUAL

HARTFORD, CONN.

PLATE XXXV

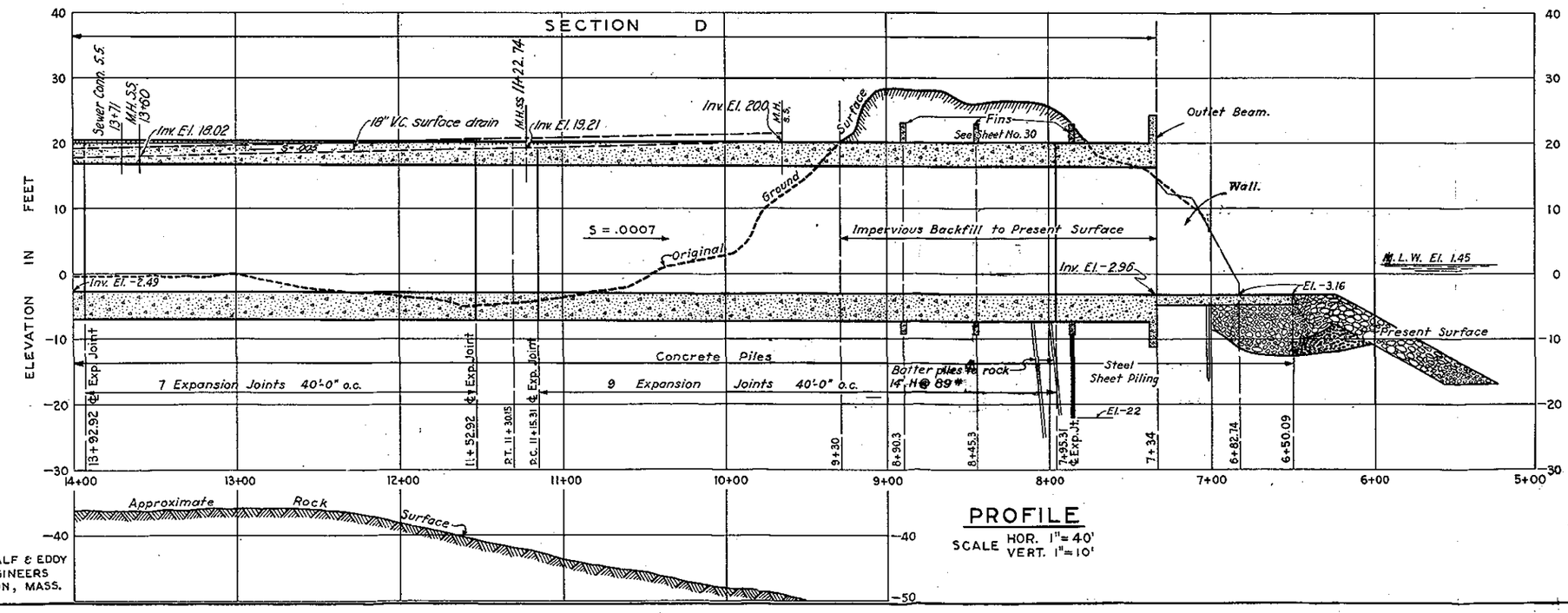
WAR DEPARTMENT

CORPS OF ENGINEERS U.S. ARMY



PLAN

SCALE 1" = 40'



PROFILE

SCALE HOR. 1" = 40'
VERT. 1" = 10'

NOTES

Stations refer to center line of conduit. Elevations refer to Mean Sea Level Datum. Coordinates refer to City of Hartford system. Ground surface line shown on profile is taken at center line of conduit.

CONNECTICUT RIVER FLOOD CONTROL

PARK RIVER CONDUIT

HARTFORD, CONN.

PLAN AND PROFILE NO. 1

CONNECTICUT RIVER CONNECTICUT

SCALE 1 IN. = 40 FT.

50' 0' 50' 100'

U.S. ENGINEER OFFICE PROVIDENCE, R.I. MAY 1940

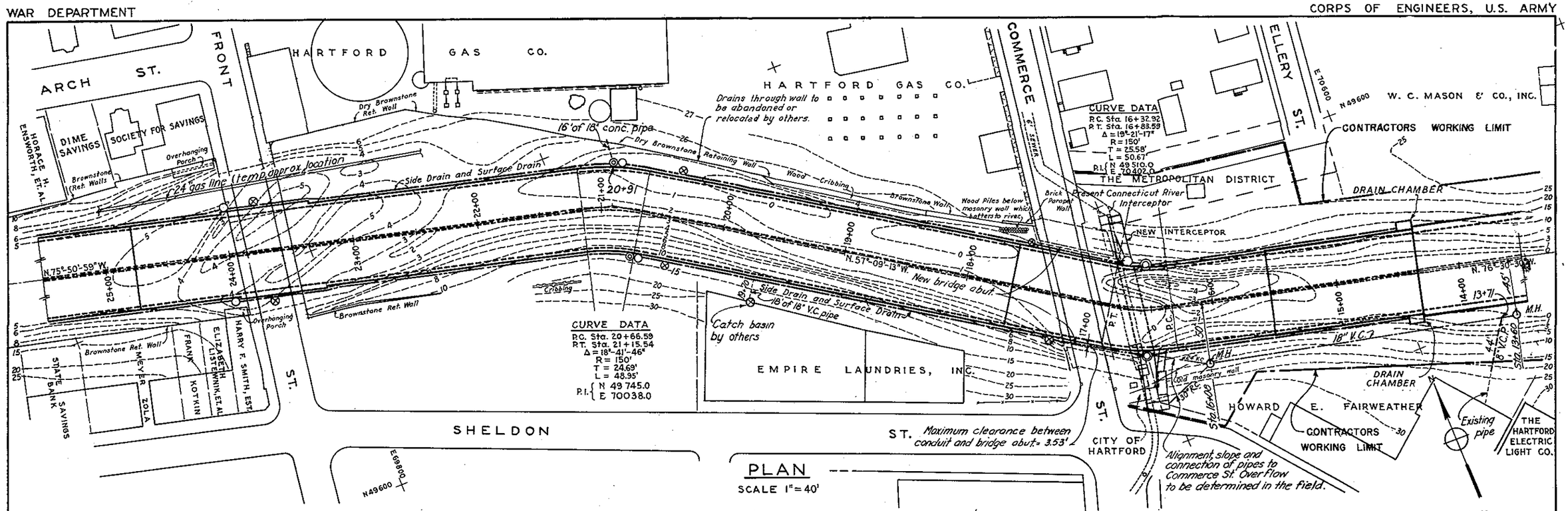
OPERATION AND MAINTENANCE MANUAL

HARTFORD, CONN.

PLATE XXXVI

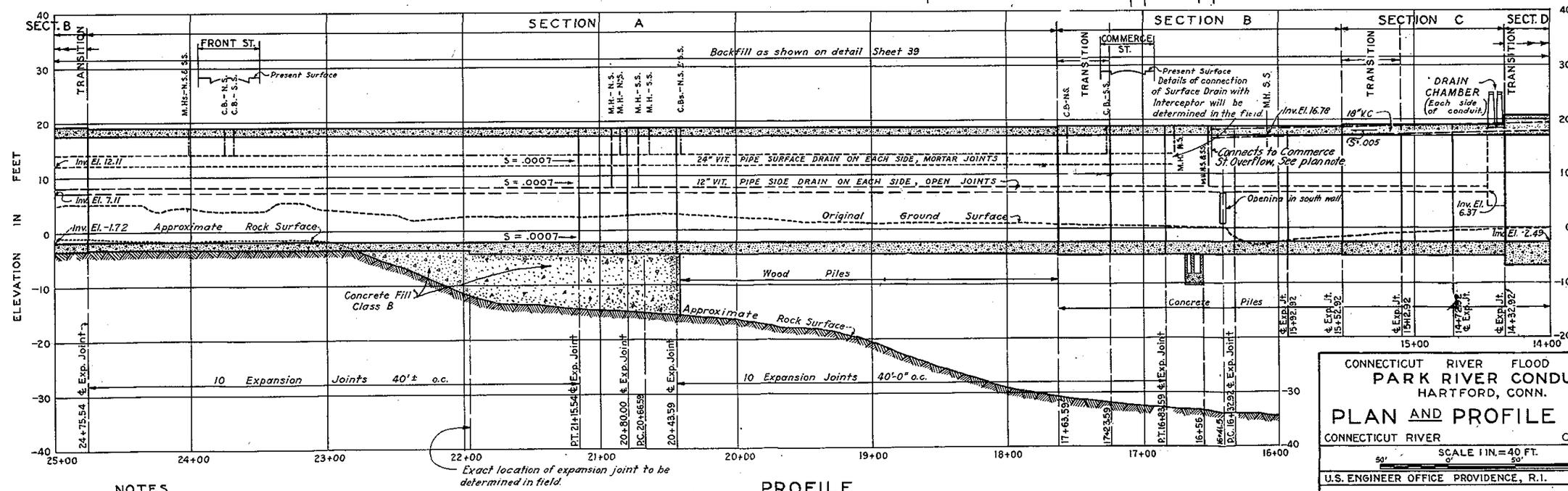
WAR DEPARTMENT

CORPS OF ENGINEERS, U.S. ARMY



PLAN

SCALE 1" = 40'



PROFILE

SCALE HOR. 1" = 40'
VERT. 1" = 10'

NOTES

For general notes applying to this sheet, see Plate XXXVI

METCALF & EDDY
ENGINEERS
BOSTON, MASS.

CONNECTICUT RIVER FLOOD CONTROL

PARK RIVER CONDUIT

HARTFORD, CONN.

PLAN AND PROFILE NO. 2

CONNECTICUT RIVER — CONNECTICUT

SCALE 1 IN. = 40 FT.

50' 0' 50' 100'

U.S. ENGINEER OFFICE PROVIDENCE, R.I. MAY 1940

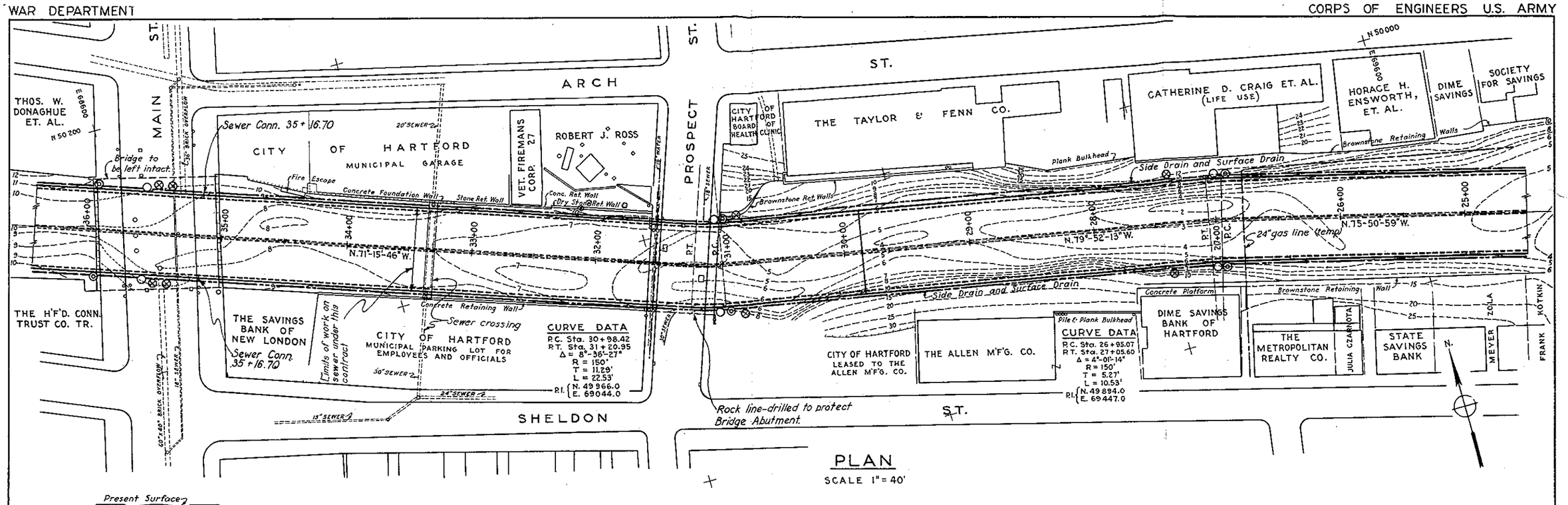
OPERATION AND MAINTENANCE MANUAL

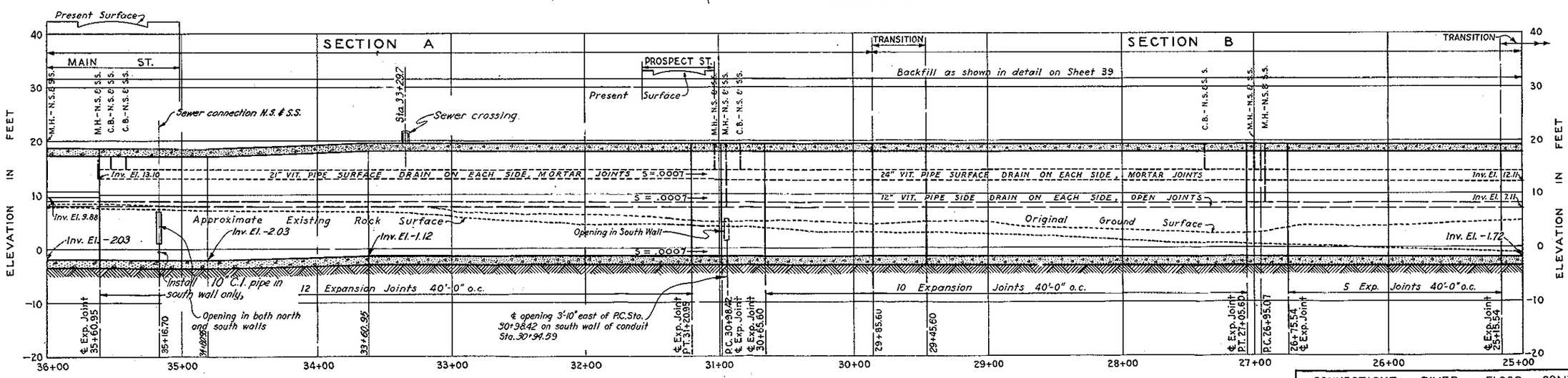
HARTFORD, CONN.

PLATE XXXVII

WAR DEPARTMENT

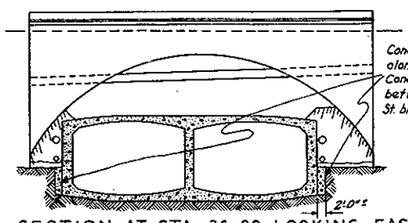
CORPS OF ENGINEERS U.S. ARMY





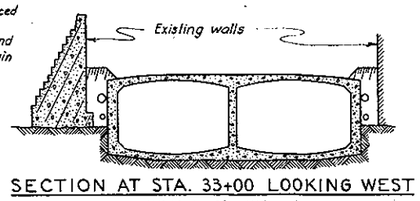
PROFILE

SCALE HOR. 1" = 40'
VERT. 1" = 10'



SECTION AT STA. 36+00 LOOKING EAST

SCALE 1" = 20'



SECTION AT STA. 33+00 LOOKING WEST

SCALE 1" = 20'

NOTES

For general notes applying to this sheet, see Plate XXXVI

METCALF & EDDY ENGINEERS BOSTON, MASS.

CONNECTICUT RIVER FLOOD CONTROL

PARK RIVER CONDUIT

HARTFORD, CONN.

PLAN AND PROFILE NO. 3

CONNECTICUT RIVER — CONNECTICUT

SCALE 1 IN. = 40 FT.

U.S. ENGINEER OFFICE PROVIDENCE, R.I. — MAY 1940

OPERATION AND MAINTENANCE MANUAL

HARTFORD, CONN.

PLATE XXXVIII

WAR DEPARTMENT

CORPS OF ENGINEERS U.S. ARMY

PARK RIVER

WELLS ST.

MAIN ST.

ELM ST.

HUDSON ST.

Side Drain

Bushnell Park Pumping Sta.

Dry Stone Retaining Wall

Rip Rap

PATH

CITY DRAIN CHAMBER

LEASED GAS. STA.

Wall to be removed as directed.

Concrete Retaining Wall Footing

NEW SIPHON

DRAIN CHAMBER

CITY OF HARTFORD

Masonry Retaining Wall

Save if possible

Light

CURVE DATA
P.C. Sta. 44+21.79
P.T. Sta. 44+48.55
Δ = 10°-13'-14"
R = 150'
T = 13.41'
L = 26.76'
P.I. (N. 50573.50
E. 67867.00

CURVE DATA
P.I. (N. 502 56.09
E. 682 64.98
P.C. Sta. 39+21.77
P.T. Sta. 39+61.71
Δ = 15°-15'-17"
R = 150'
T = 20.09'
L = 39.94'

CURVE DATA
P.I. (N. 501 58.50
E. 684 76.50
P.C. Sta. 37+01.02
P.T. Sta. 37+16.81
Δ = 6°-01'-48"
R = 150'
T = 7.90'
L = 15.79'

GEORGE B. SCHWARTZ

SOCIETY FOR SAVINGS

THE G.W. CUNNINGHAM CO., INC.

THOS. W. DONAGHUE, ET. AL.

6"of 6" steel pipe (Vertical)

WM. G. KIMBALL ET. AL.

OTTO EPSTEIN

ROSE LEVY

CITY OF HARTFORD

THE HARTFORD CONN. TRUST CO., TR.

Overhanging Porch

N 50400 E 68400

N 50600 E 67600

N. 60°-11'-55" W.

N. 49°-58'-41" W.

N. 65°-13'-58" W.

N. 71°-15'-46" W.

38+45

B.....Birch
BW....Basswood
C.....Chestnut
E.....Elm
M.....Maple
O.....Oak
W.....Willow

Tree which will be moved by city.
Tree which may be cut down by contractor.
All trees not marked are to be saved.

PLAN
SCALE 1" = 40'

SECTION B | SECTION C | SECTION B | TRANSITION | SECT. A

Special Transition

Backfill approximately as shown.

TRANSITION Monolith #87

Slope 1 on 2

Original Ground Surface

Inv. El. 15.08

12" VITRIFIED PIPE SIDE DRAIN ON EACH SIDE, OPEN JOINTS

Inv. El. 6.25

S = .006

For sewer connections at Bushnell Park Pumping Station

El. 11.6

El. 4.92

DRAIN CHAMBER South Side

DRAIN CHAMBER North Side

Present Sewer

Inv. El. 10.96

Inv. El. 10.88

Spacing in South wall.

NEW SIPHON

Approximate Rock Surface

Class B Concrete

9 Expansion Joints 40'± o.c.

12 Expansion Joints 40'-0" o.c.

8 Exp. Joints 40'-0" o.c.

Original ground surface

Inv. El. 14.76

Inv. El. 9.88

Joints Surface

Inv. El. -2.05

El. 0.23

M.H. - N.S. E S.S.

Sta. 48+68.55 ℄ Exp. Jt.
Sta. 47+00 ℄ Exp. Jt.
Sta. 46+00 ℄ Exp. Jt.
Sta. 45+00 ℄ Exp. Jt.
P.T. 44+48.55
P.C. 44+21.79
Sta. 44+01.71 ℄ Exp. Jt.
Sta. 43+31
Sta. 42+81.71
Sta. 42+41.71
P.T. 39+61.71 ℄ Exp. Jt.
P.C. 39+21.77 ℄ Exp. Jt.
Sta. 39+11.77
Sta. 38+80.95 ℄ Exp. Jt.
P.T. 37+20.95
P.C. 37+01.02
P.T. 37+00.02
Sta. 36+80.95
Sta. 36+40.95
℄ Exp. Jt. 36+00.95

48+00 47+00 46+00 45+00 44+00 43+00 42+00 41+00 40+00 39+00 38+00 37+00 36+00

ELEVATION IN FEET

50 40 30 20 10 0 -10

PROFILE
SCALE HOR. 1" = 40'
VERT. 1" = 10'

NOTES

For general notes applying to this sheet, See Plate XXXVI

METCALF & EDDY
ENGINEERS
BOSTON, MASS.

CONNECTICUT RIVER FLOOD CONTROL
PARK RIVER CONDUIT
HARTFORD, CONN.

PLAN AND PROFILE NO. 4

CONNECTICUT RIVER — CONNECTICUT

SCALE 1 IN. = 40 FT.
50' 0' 50' 100'

U.S. ENGINEER OFFICE PROVIDENCE, R.I. MAY 1940

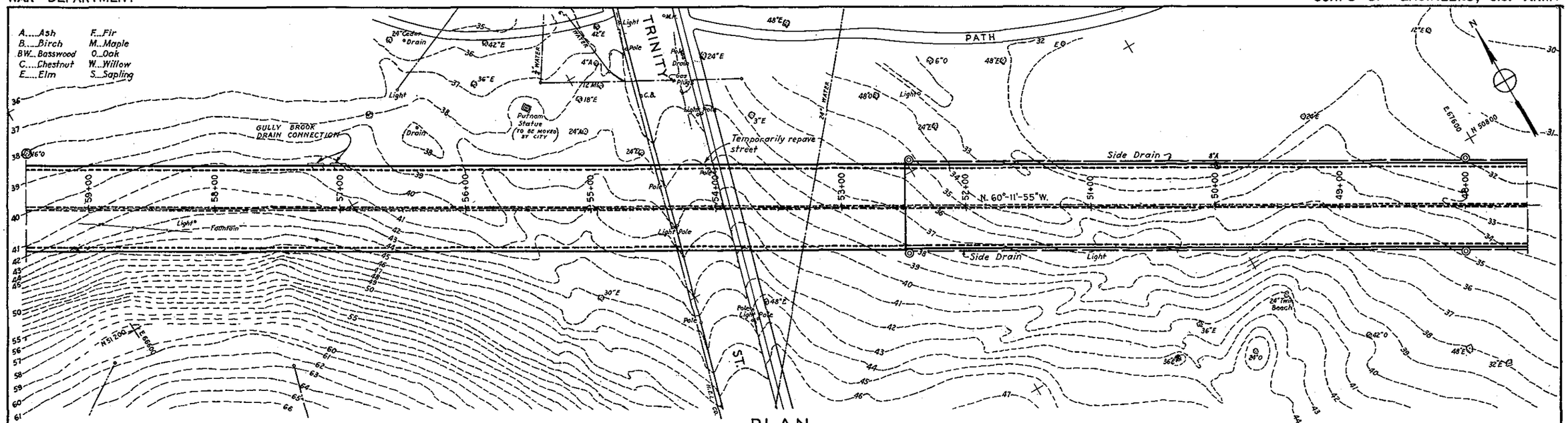
OPERATION AND MAINTENANCE MANUAL
HARTFORD, CONN.

PLATE XXXIX

WAR DEPARTMENT

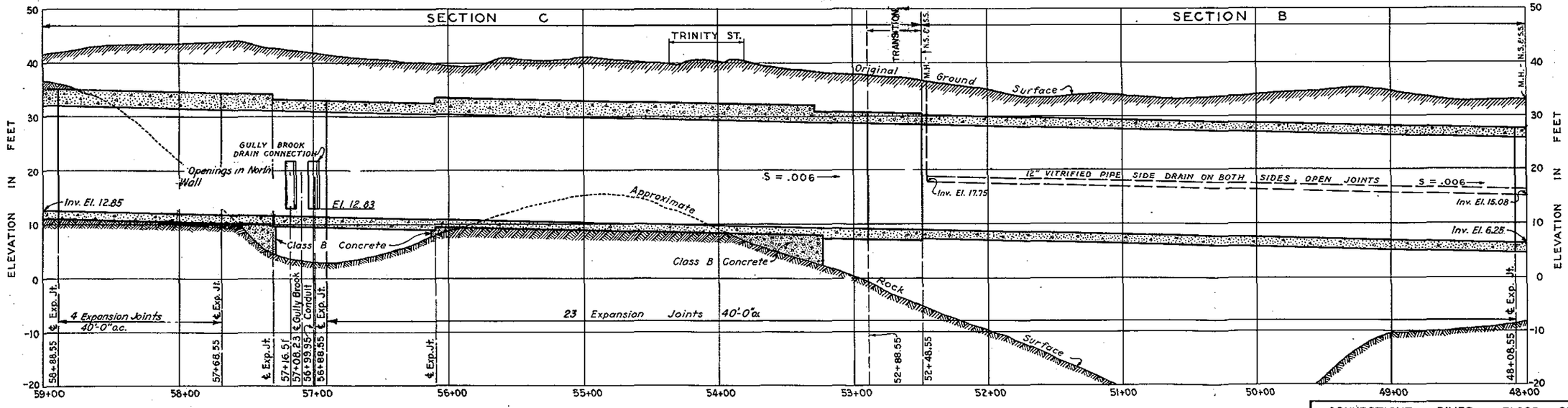
CORPS OF ENGINEERS, U.S. ARMY

A....Ash F...Fir
B....Birch M...Maple
BW..Basswood O...Oak
C....Chestnut W...Willow
E....Elm S...Sapling



PLAN

SCALE 1"=40'



PROFILE

SCALE HOR. 1"=40'
VERT. 1"=10'

NOTES

For general notes applying to this sheet, see Plate XXXVI

METCALF & EDDY
ENGINEERS
BOSTON, MASS.

CONNECTICUT RIVER FLOOD CONTROL

PARK RIVER CONDUIT
HARTFORD, CONN.

PLAN AND PROFILE NO. 5

CONNECTICUT RIVER CONNECTICUT

SCALE 1 IN. = 40 FT.

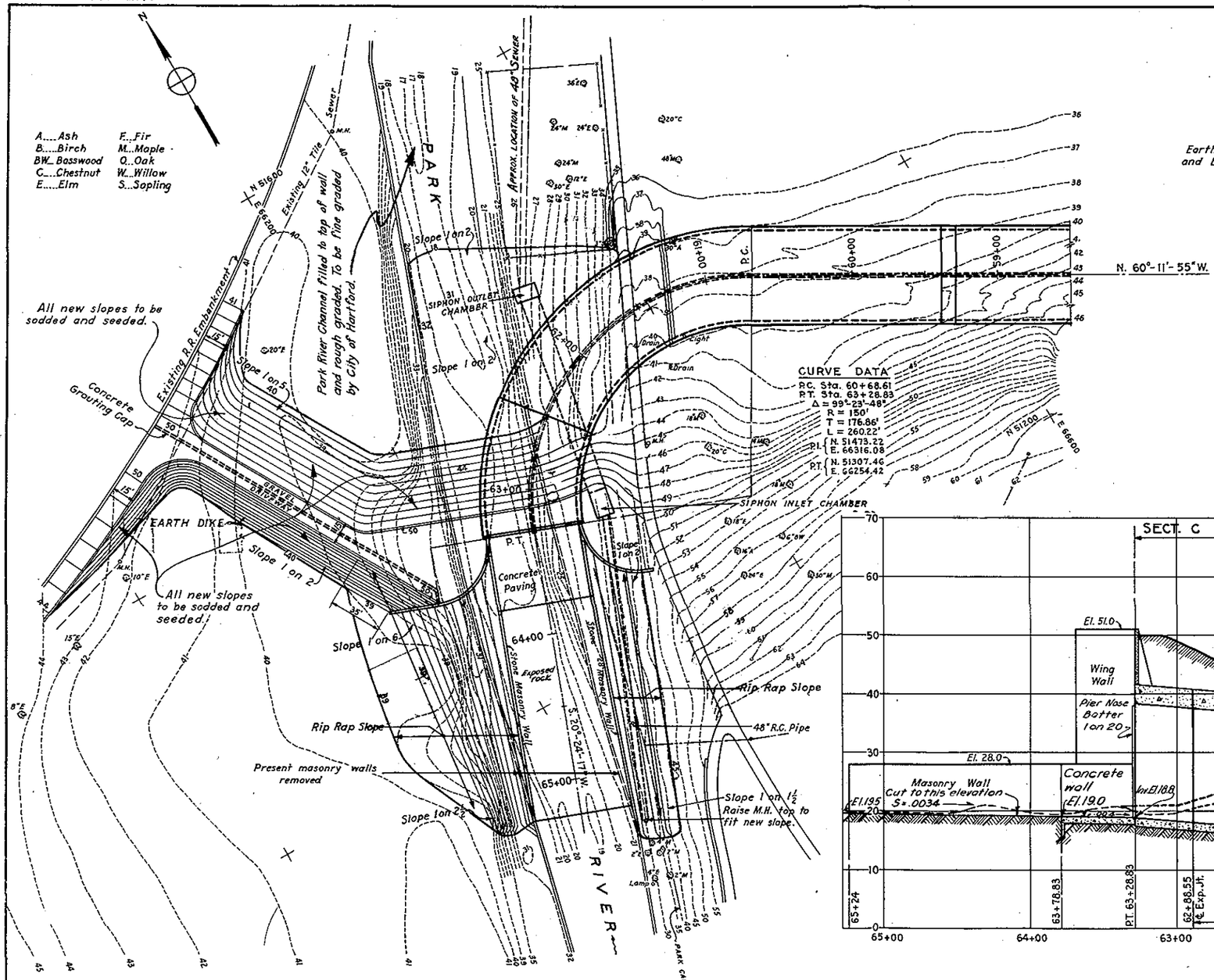
U.S. ENGINEER OFFICE PROVIDENCE, R.I. MAY 1940

OPERATION AND MAINTENANCE MANUAL
HARTFORD, CONN.

PLATE XL

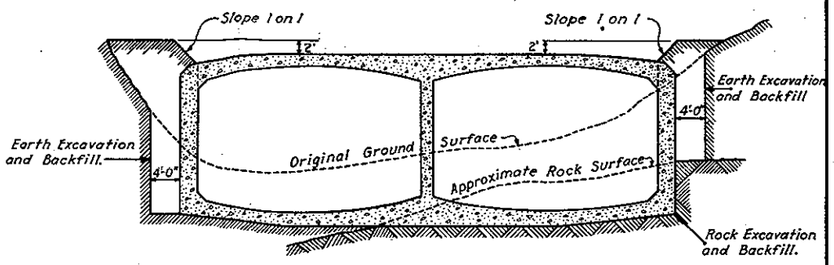
WAR DEPARTMENT

CORPS OF ENGINEERS, U.S. ARMY



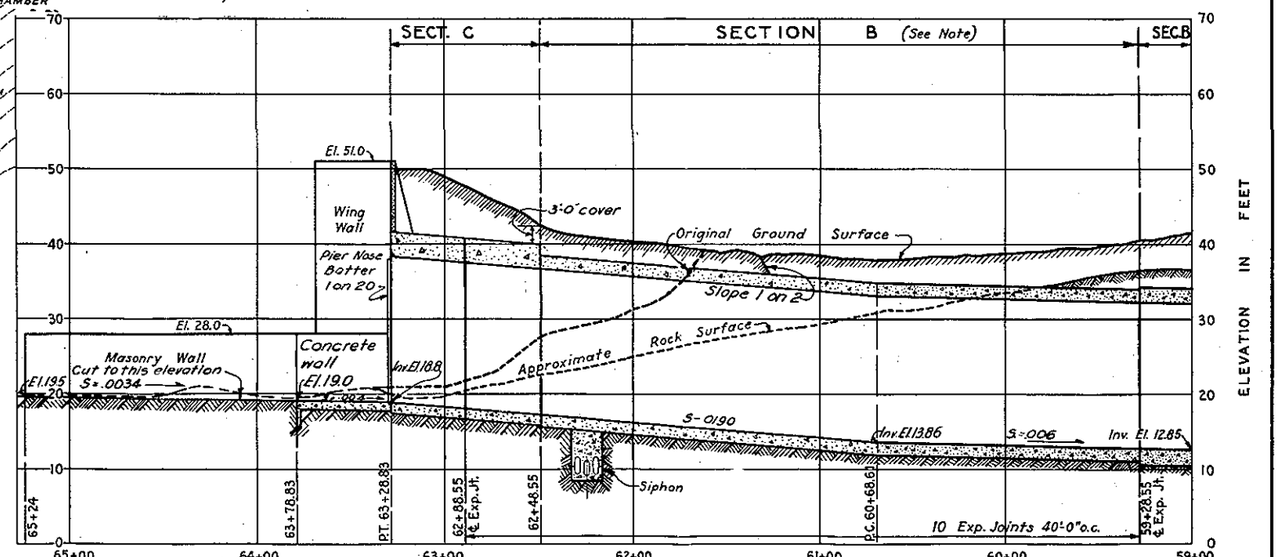
PLAN

SCALE 1" = 40'



LIMIT OF PAYMENT LINES

SCALE 1" = 10'



PROFILE

SCALE HOR. 1" = 40'
VERT. 1" = 10'

NOTES

For general notes applying to this sheet, see Plate XXXVI

METCALF & EDDY
ENGINEERS
BOSTON, MASS.

CONNECTICUT RIVER FLOOD CONTROL

PARK RIVER CONDUIT

HARTFORD, CONN.

PLAN AND PROFILE NO. 6

CONNECTICUT RIVER — CONNECTICUT

SCALE 1 IN. = 40 FT.

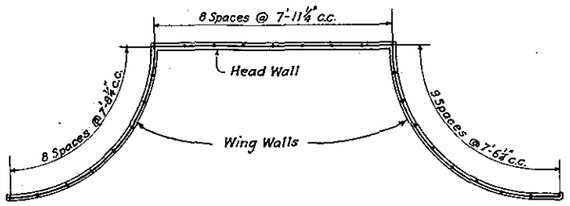
50' 0' 50' 100'

U.S. ENGINEER OFFICE PROVIDENCE, R.I. MAY 1940

OPERATION AND MAINTENANCE MANUAL

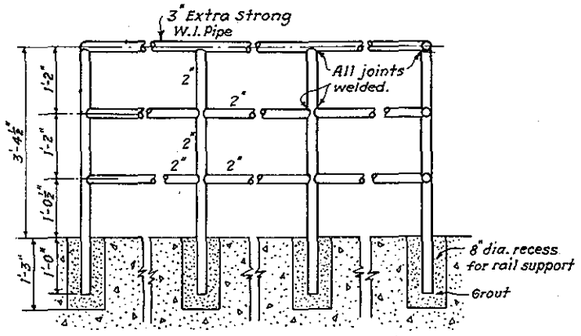
HARTFORD, CONN.

PLATE XLI

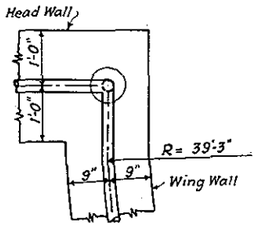


PLAN OF PIPE RAILING

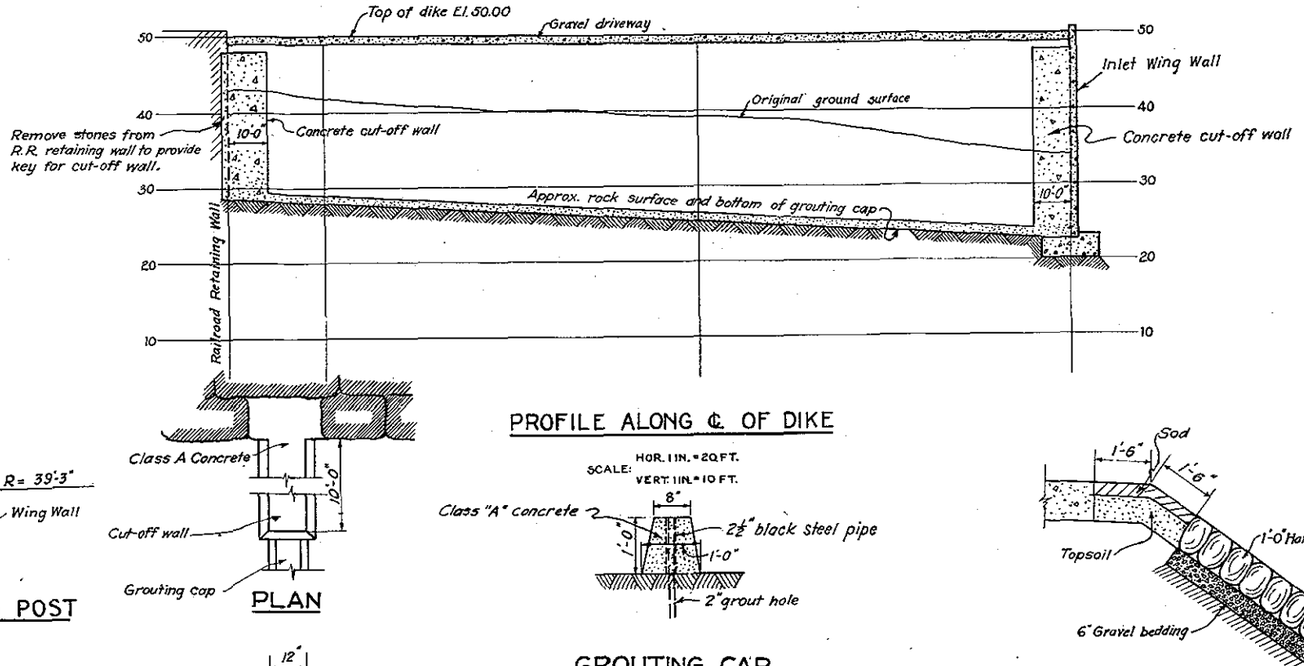
SCALE; 1" = 20'



PIPE RAILING



CORNER RAILING POST



PLAN

PROFILE ALONG ℄ OF DIKE

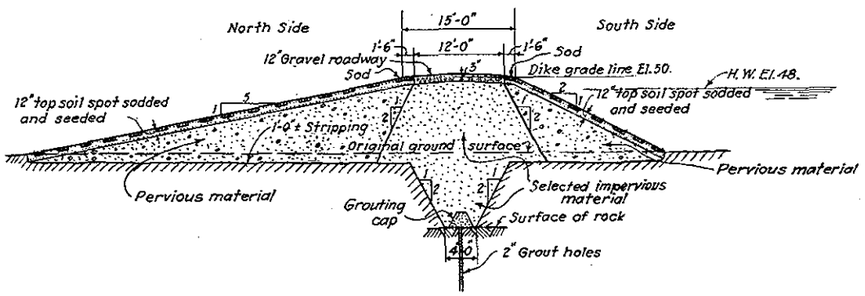
SCALE: HOR. 1 IN. = 20 FT.
VERT. 1 IN. = 10 FT.

GROUTING CAP

SCALE ½" = 1'-0"

DETAIL OF RIPRAP

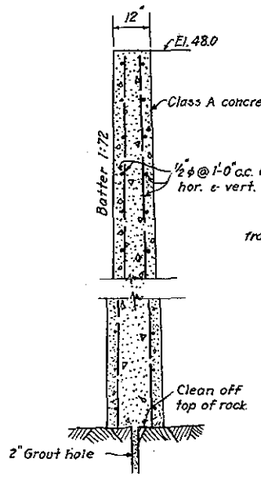
SCALE; 1" = 1'-0"



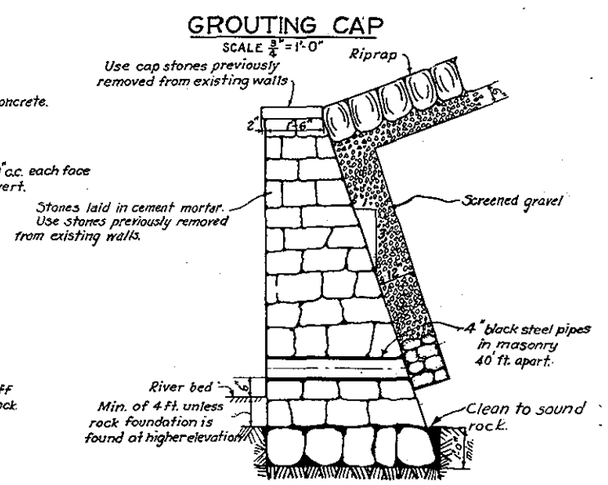
DIKE

SCALE; 1" = 10'

TYPICAL SECTION



CUT-OFF WALL SCALE; ½" = 1'-0"



MASONRY WALL

CONNECTICUT RIVER FLOOD CONTROL

PARK RIVER CONDUIT

HARTFORD, CONN.

MISCELLANEOUS INLET DETAILS

CONNECTICUT RIVER — CONNECTICUT

SCALE: 1 IN. = 20 FT.

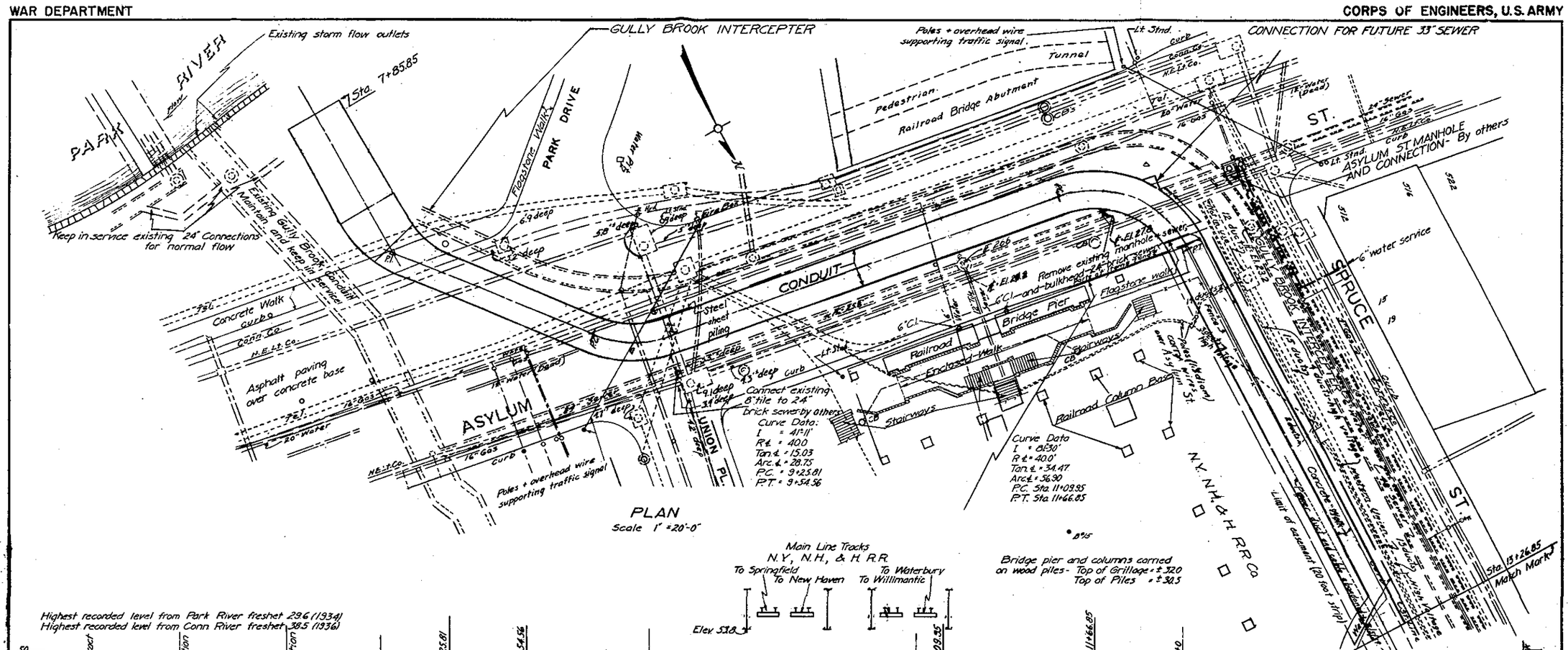
U.S. ENGINEER OFFICE PROVIDENCE, R.I. — MAY 1940

OPERATION AND MAINTENANCE MANUAL

HARTFORD, CONN.

METCALF & EDDY
ENGINEERS
BOSTON, MASS.

PLATE XLII



NOTE Elevations refer to Hartford City Datum which is 2.08 feet below Mean Sea Level, datum used by U.S. Engineers.

CONNECTICUT RIVER FLOOD CONTROL

GULLY BROOK CONDUIT

HARTFORD, CONN.

PLAN AND PROFILE ASYLUM ST. AND SPRUCE ST.
STA. 7+85.85 to STA. 13+ 26.85

PARK RIVER CONNECTICUT

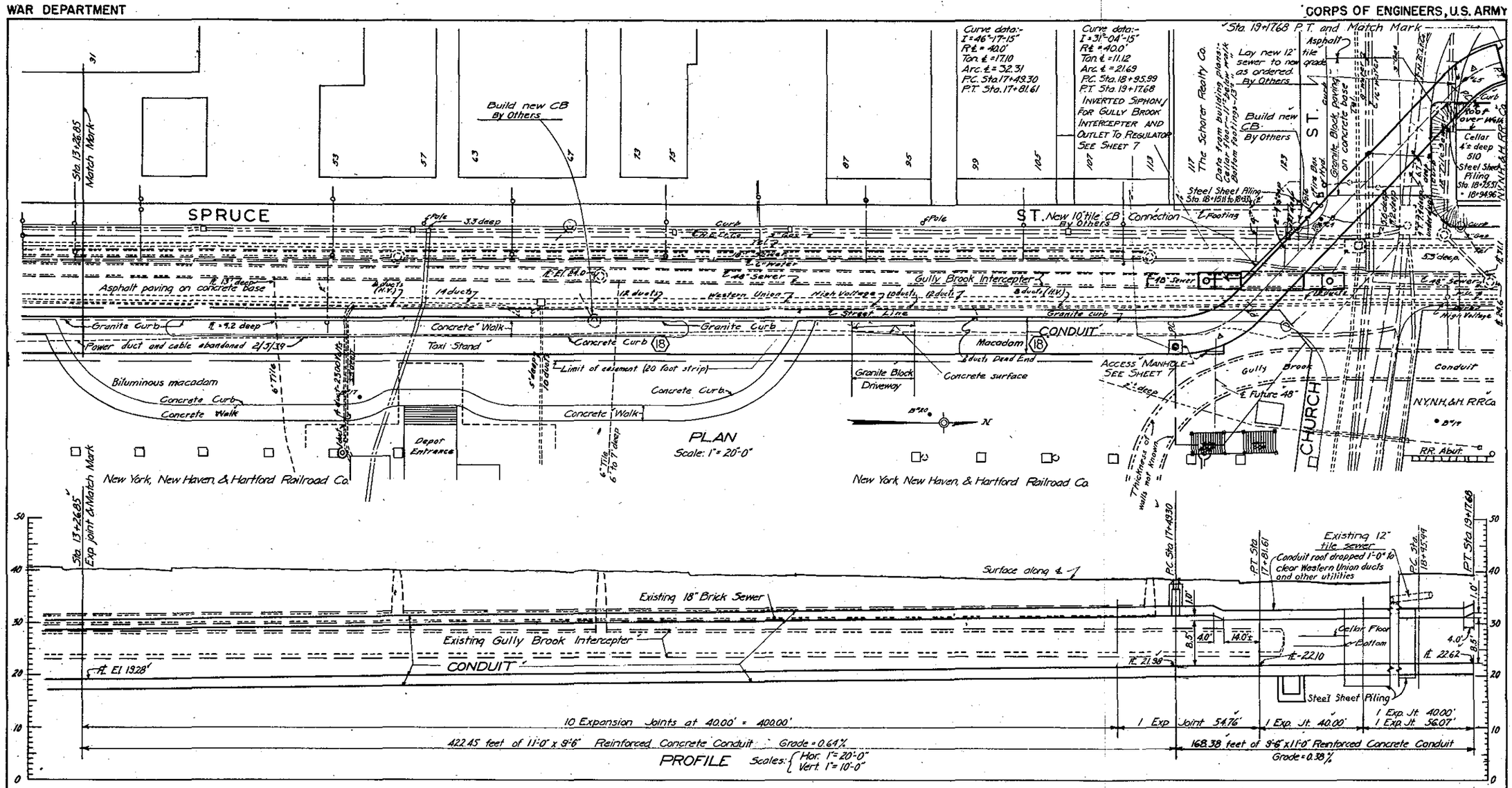
SCALE: 1 IN. = 20 FT.

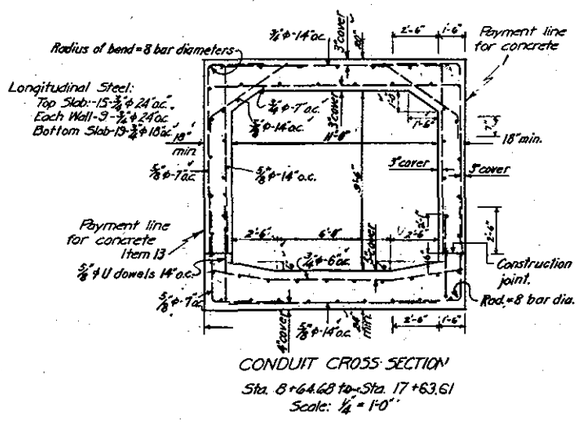
U.S. ENGINEER OFFICE, PROVIDENCE, R.I. JULY 1943

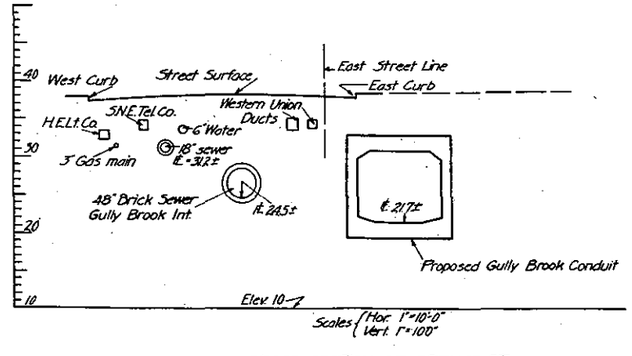
OPERATION AND MAINTENANCE MANUAL

HARTFORD, CONN.

PLATE XLIII







NOTE

For general notes applying to this sheet see Plate XLIII.

CONNECTICUT RIVER FLOOD CONTROL

GULLY BROOK CONDUIT

HARTFORD, CONN.

PLAN AND PROFILE

SPRUCE STREET-CONDUIT SECTION

STA. 13+26.85 TO STA. 19+17.68

PARK RIVER CONNECTICUT

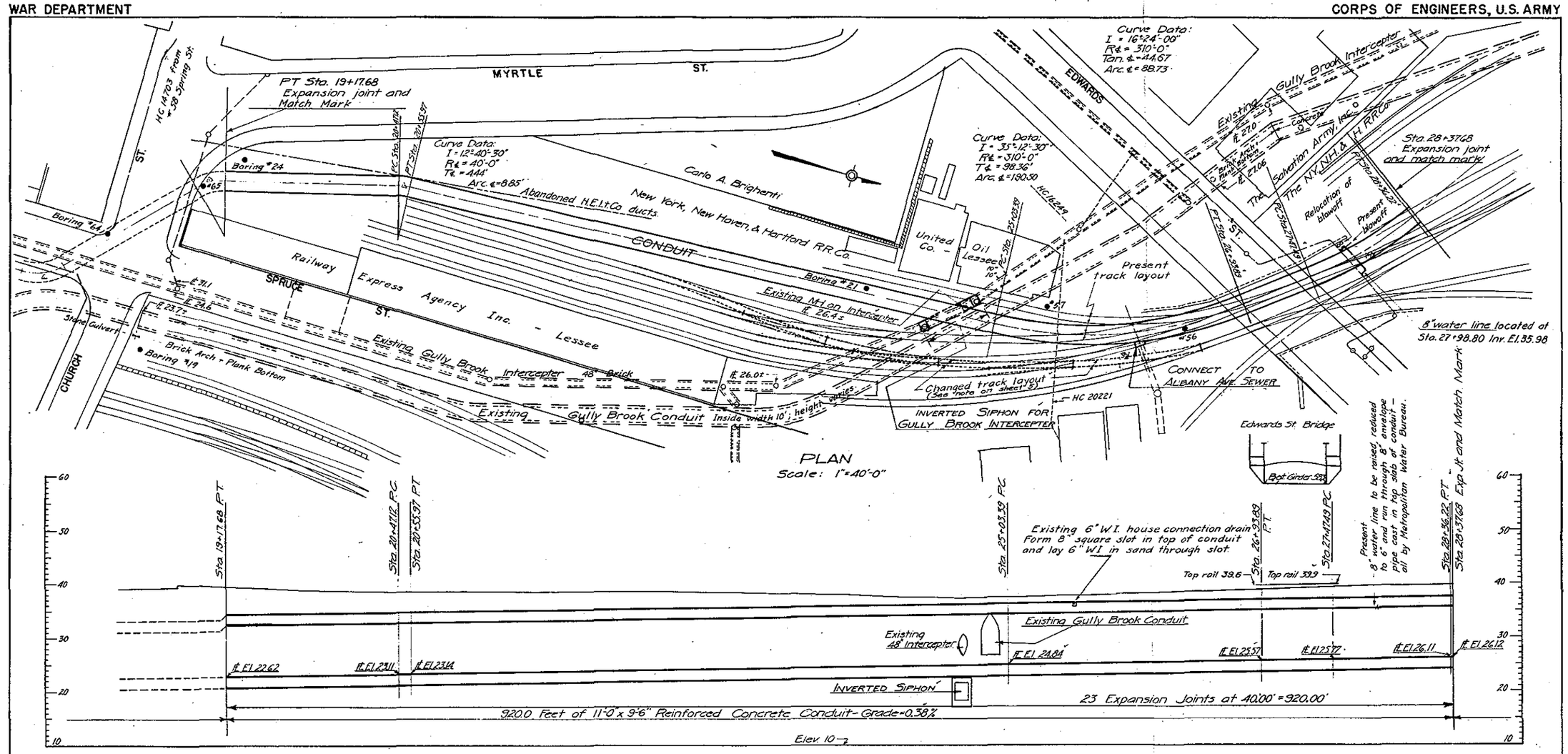
SCALE: 1 IN. = 20 FT.

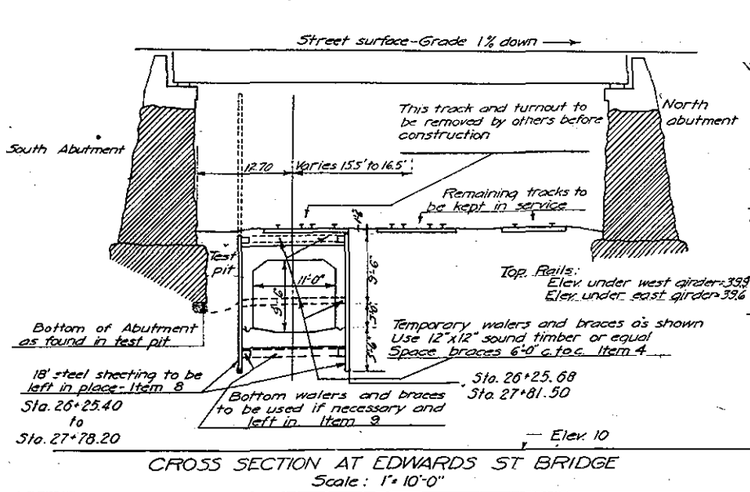
U. S. ENGINEER OFFICE, PROVIDENCE, R.I. JULY 1943

OPERATION AND MAINTENANCE MANUAL

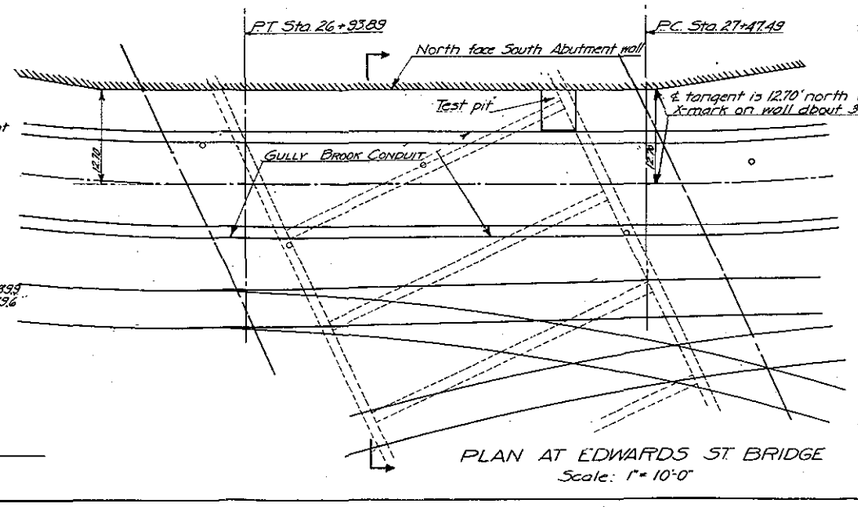
HARTFORD, CONN.

PLATE XLIV





CROSS SECTION AT EDWARDS ST BRIDGE
Scale: 1" = 10'-0"



PLAN AT EDWARDS ST BRIDGE
Scale: 1" = 10'-0"

NOTE

For general notes applying to this sheet see Plate XLIII.

CONNECTICUT RIVER FLOOD CONTROL

GULLY BROOK CONDUIT

HARTFORD CONN.

PLAN AND PROFILE

FROM CHURCH STREET TO EDWARDS STREET

STA. 19+17.68 TO STA. 28+37.68

PARK RIVER CONNECTICUT

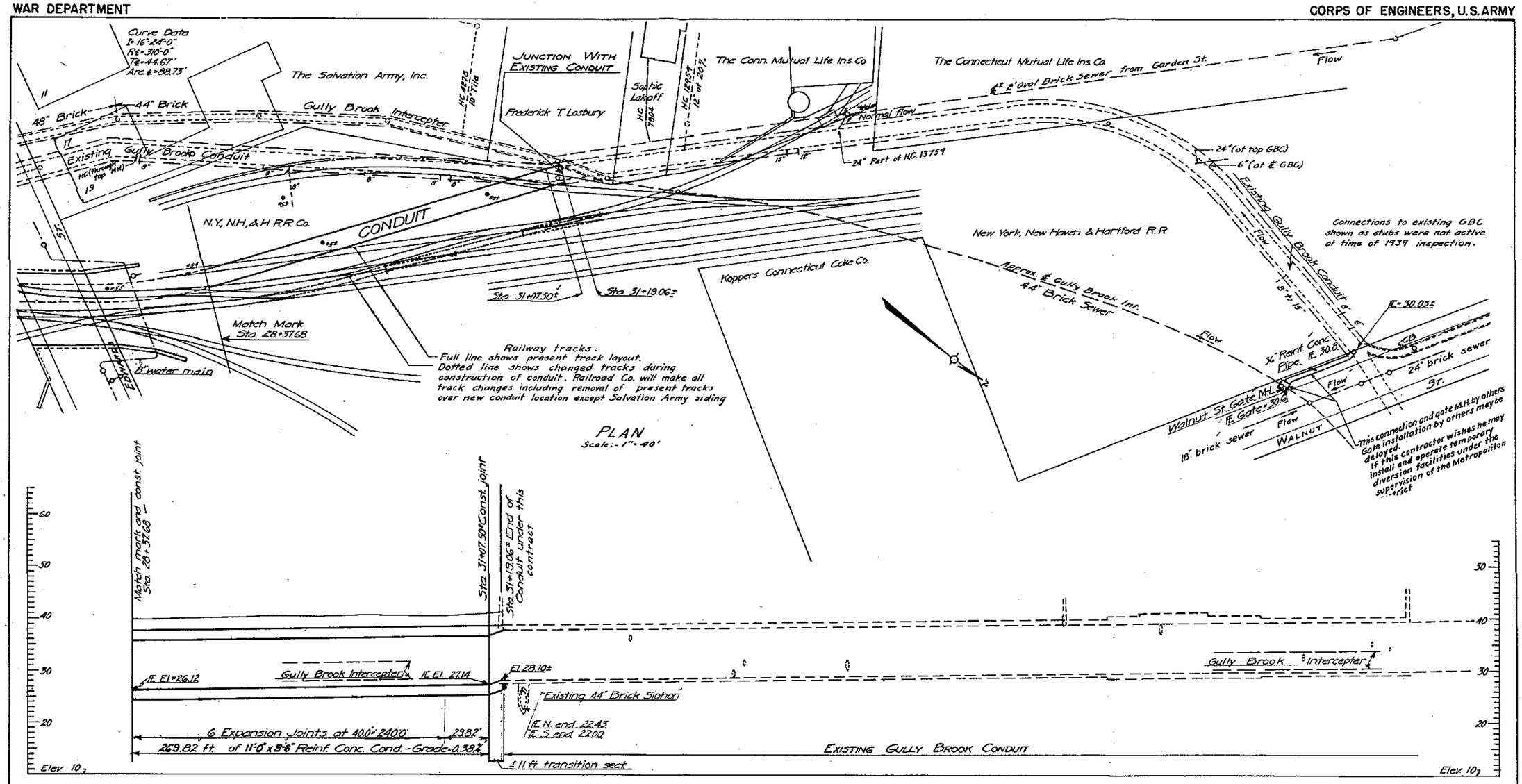
SCALE AS SHOWN

U. S. ENGINEER OFFICE, PROVIDENCE, R.I., JULY, 1943

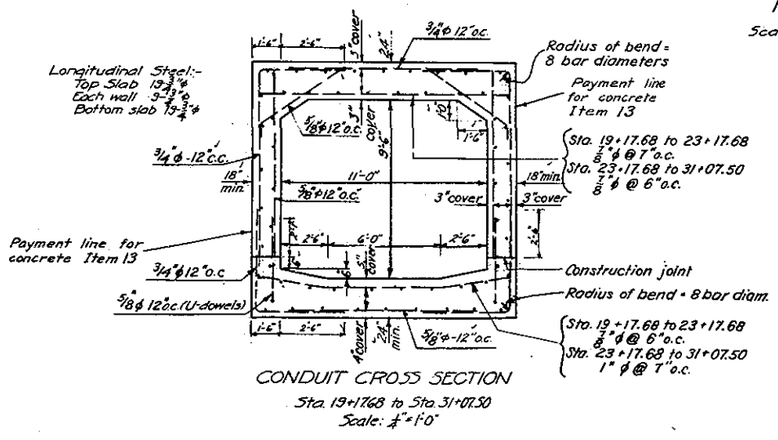
OPERATION AND MAINTENANCE MANUAL

HARTFORD, CONN

PLATE XLV



PROFILE
Scale: Hor. 1"=40'-0"
Vert 1"=10'-0"



CONDUIT CROSS SECTION
Sta. 19+17.68 to Sta. 31+07.50
Scale: 1/4"=1'-0"

NOTE

For general notes applying to this sheet see Plate XLIII.

CONNECTICUT RIVER FLOOD CONTROL

GULLY BROOK CONDUIT

HARTFORD, CONN.

PLAN & PROFILE

FROM EDWARD ST. WEST STA. 28+37.68 TO STA. 31+19.06

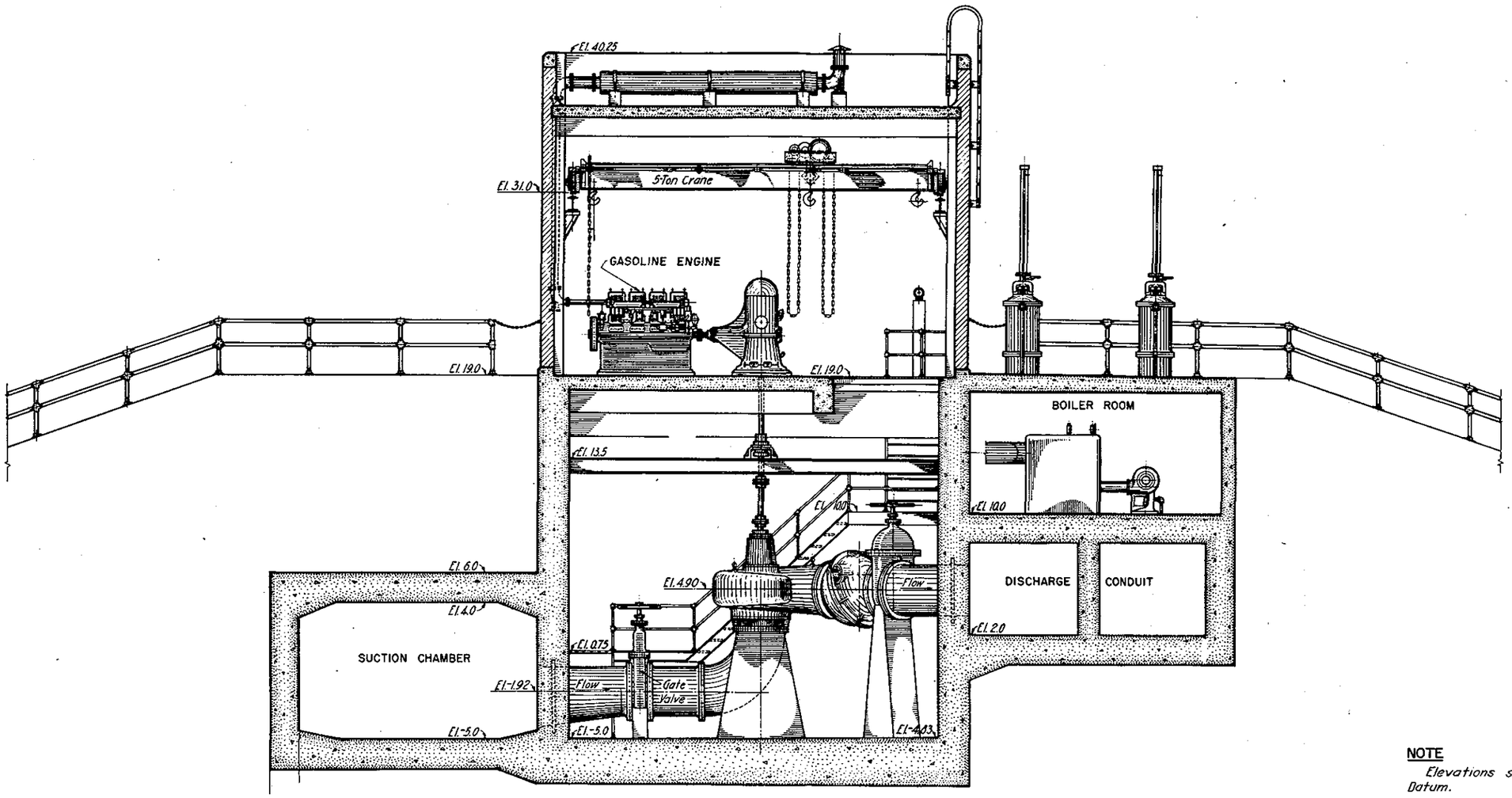
PARK RIVER CONNECTICUT

SCALE AS SHOWN

U. S. ENGINEER OFFICE, PROVIDENCE, R.I. JULY 1943

OPERATION AND MAINTENANCE MANUAL

HARTFORD, CONN.



GENERAL ARRANGEMENT OF EQUIPMENT

NOTE

Elevations shown refer to Mean Sea Level Datum.

CONNECTICUT RIVER FLOOD CONTROL

NORTH MEADOWS PUMPING STATION

HARTFORD, CONN.

CONNECTICUT RIVER	CONNECTICUT
IN SHEETS	SHEET NO.

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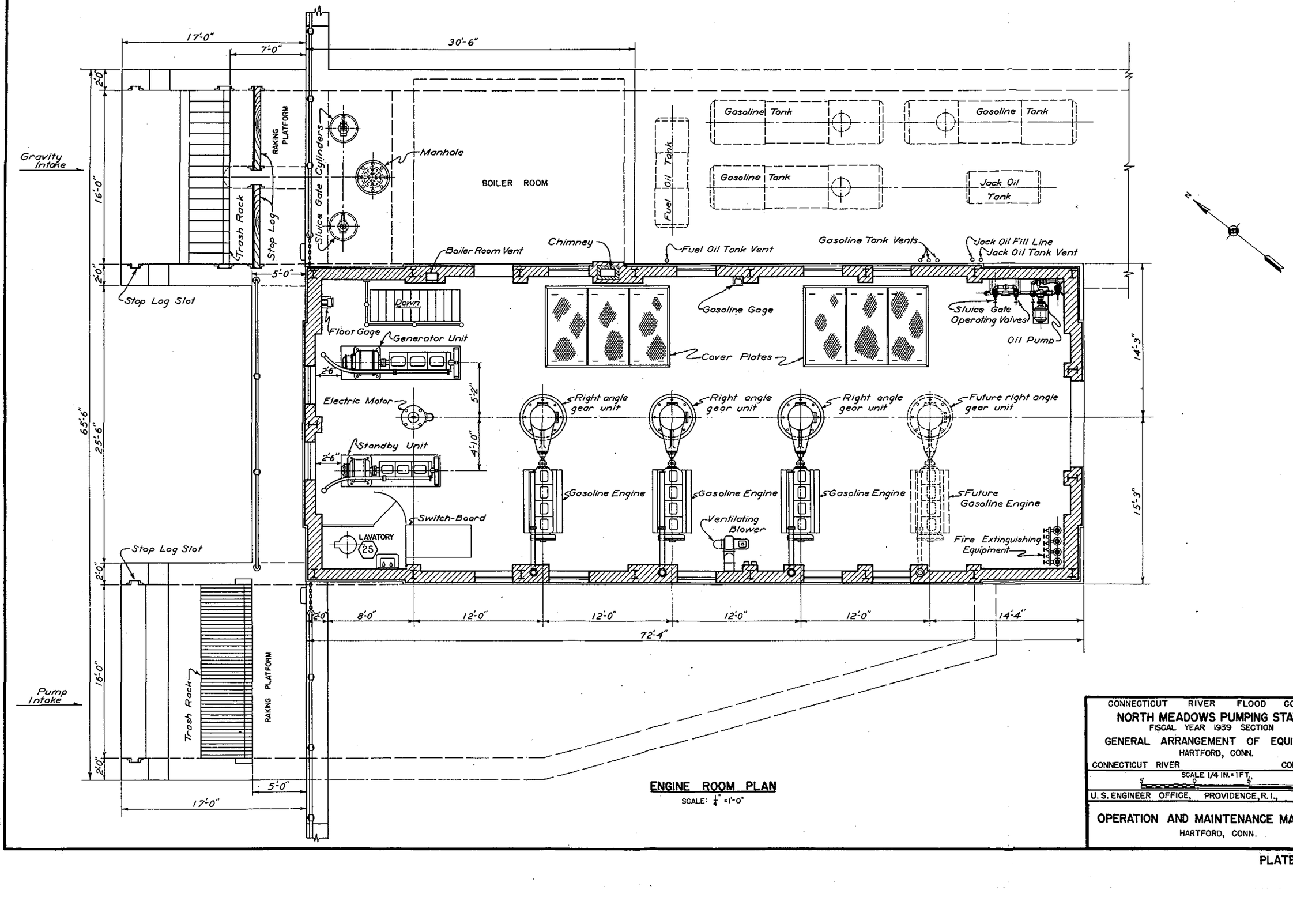
OPERATION AND MAINTENANCE MANUAL

HARTFORD, CONN.

PLATE XLVII



ENGINE ROOM PLAN

SCALE: 1/4" = 1'-0"

CONNECTICUT RIVER FLOOD CONTROL

NORTH MEADOWS PUMPING STATION

FISCAL YEAR 1939 SECTION

GENERAL ARRANGEMENT OF EQUIPMENT

HARTFORD, CONN.

CONNECTICUT RIVER CONNECTI

SCALE 1/4 IN. = 1 FT.

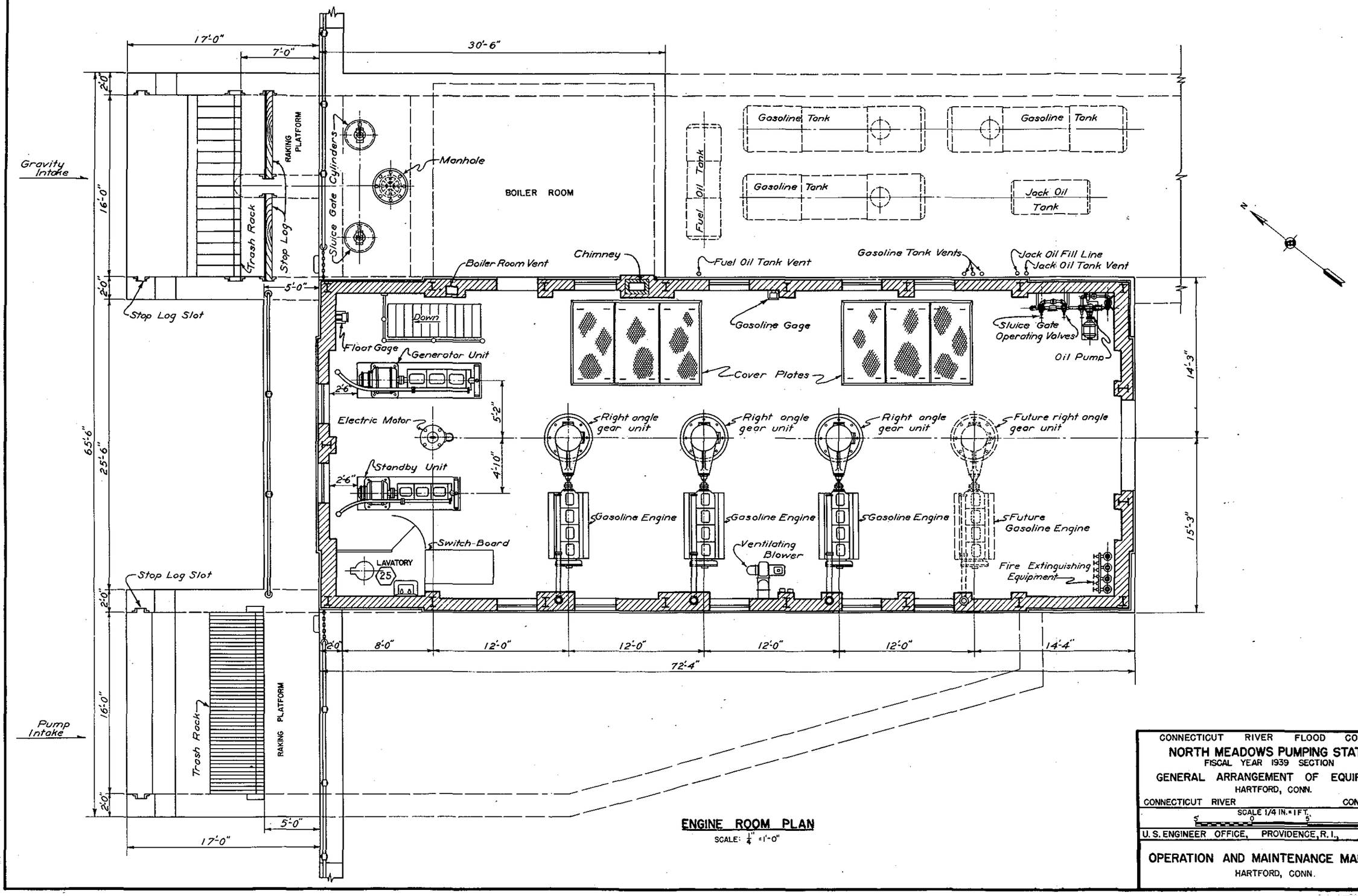
5' 0 5' 10

U. S. ENGINEER OFFICE, PROVIDENCE, R. I., FEB.

OPERATION AND MAINTENANCE MANUAL

HARTFORD, CONN.

PLATE XL



ENGINE ROOM PLAN

SCALE: 1/4" = 1'-0"

CONNECTICUT RIVER FLOOD CONTROL

NORTH MEADOWS PUMPING STATION

FISCAL YEAR 1939 SECTION

GENERAL ARRANGEMENT OF EQUIPMENT

HARTFORD, CONN.

CONNECTICUT RIVER — CONNECTICUT

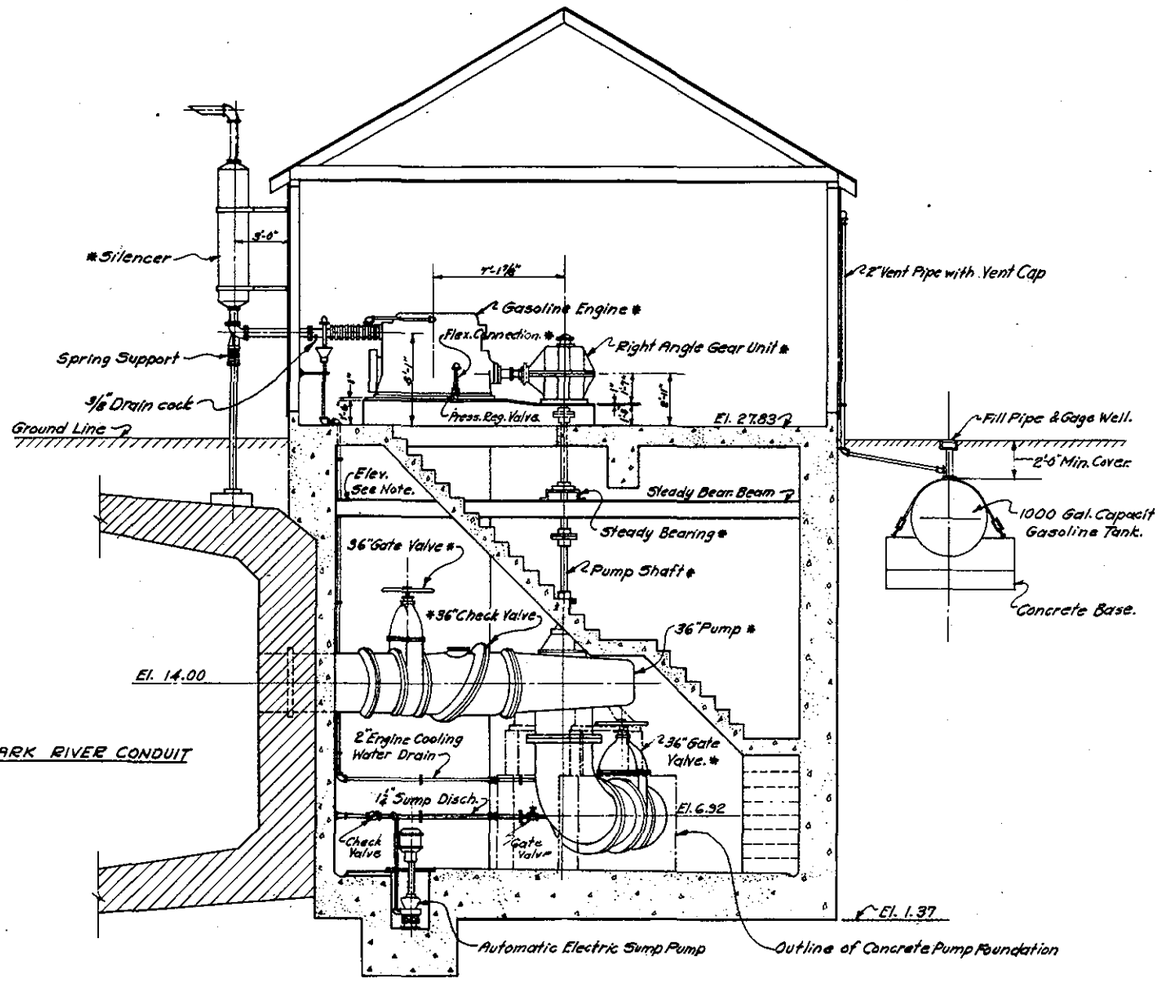
SCALE 1/4 IN. = 1 FT.

U. S. ENGINEER OFFICE, PROVIDENCE, R. I., FEB. 1939

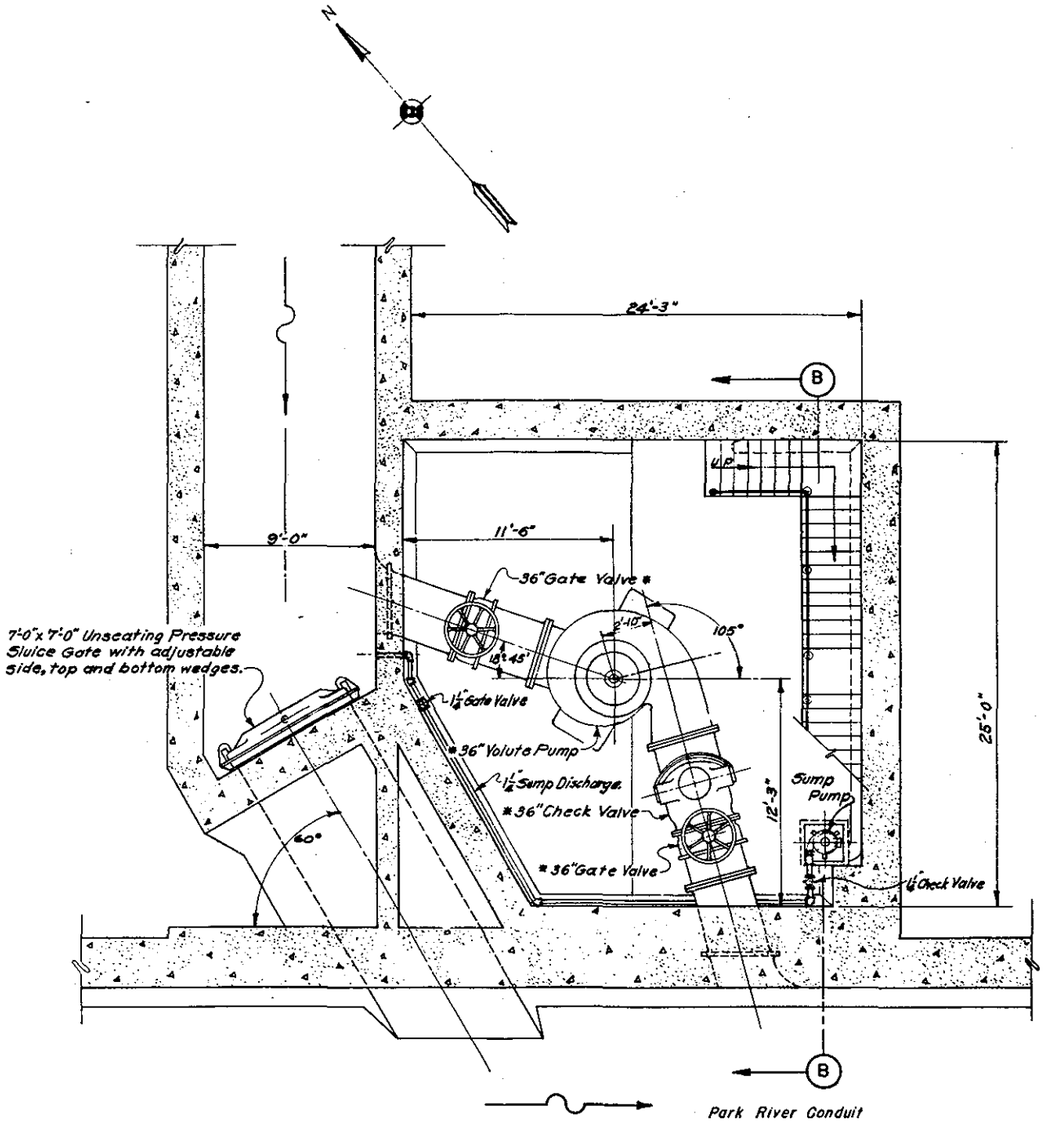
OPERATION AND MAINTENANCE MANUAL

HARTFORD, CONN.

PLATE XLVIII



SECTION B/B



PUMP ROOM PLAN

NOTES

*Indicates equipment taken from North Meadows Pumping Station. Elevations shown refer to Mean Sea Level Datum.

CONNECTICUT RIVER FLOOD CONTROL

BUSHNELL PARK PUMPING STATION

HARTFORD, CONN.

CONNECTICUT RIVER — CONNECTICUT

SCALE: 1/4 IN. = 1 FT.

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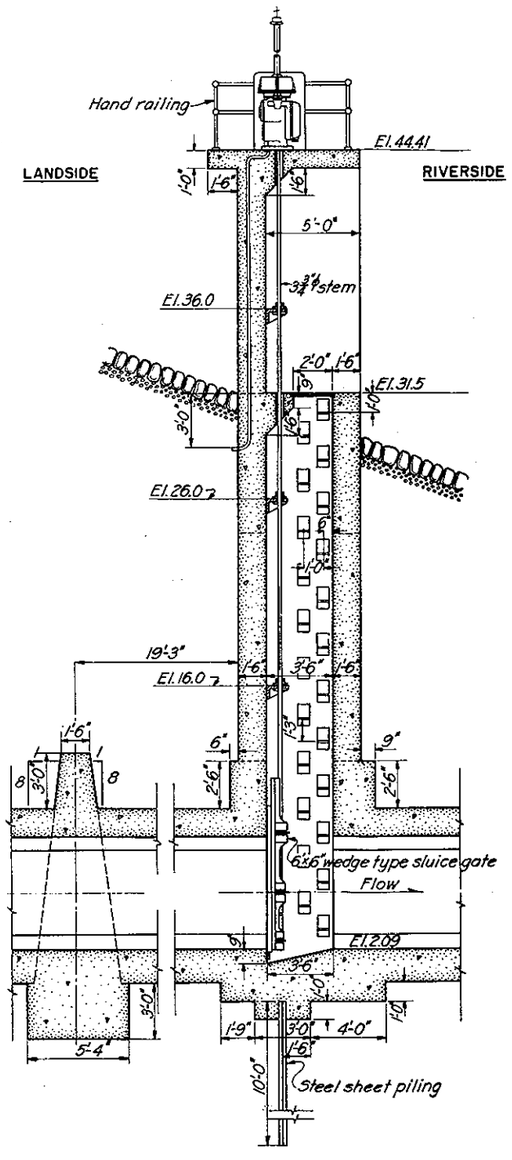
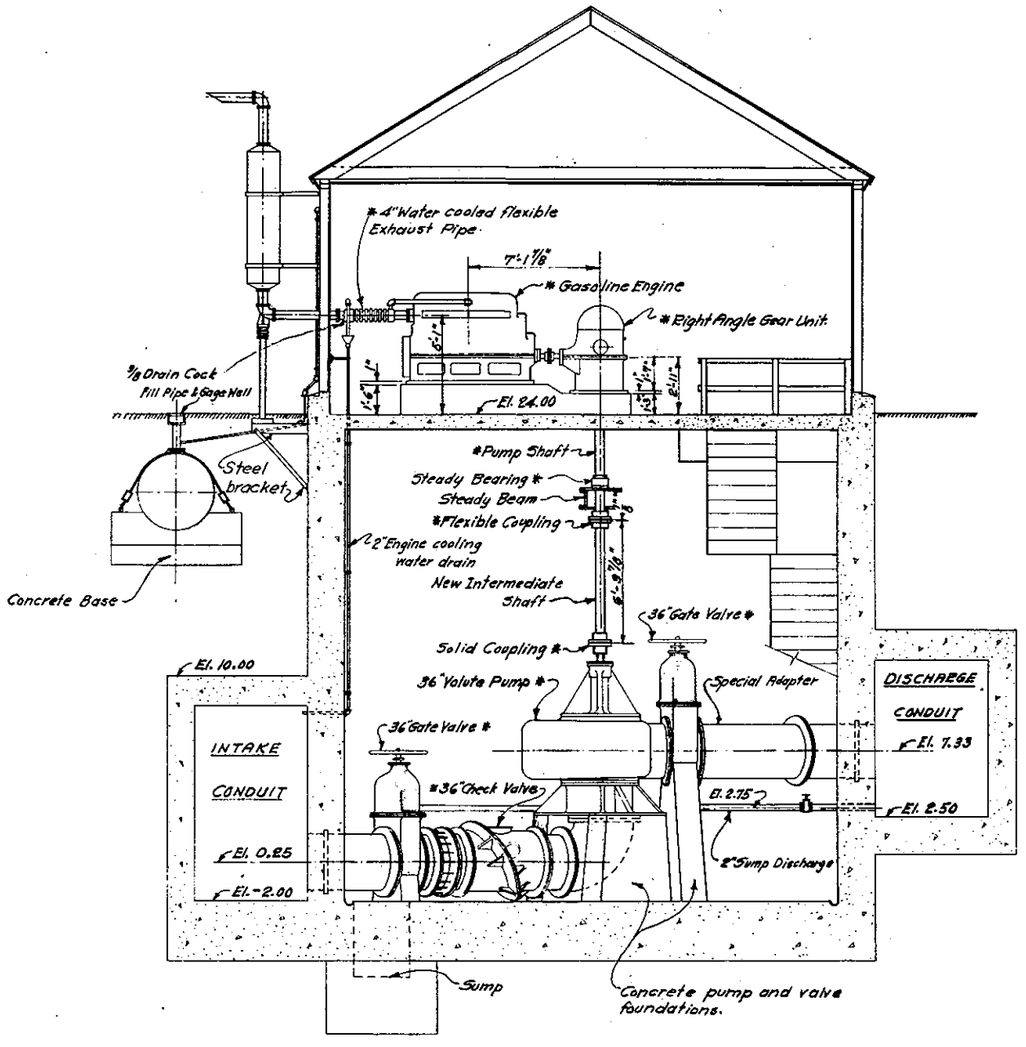
HARTFORD, CONN.

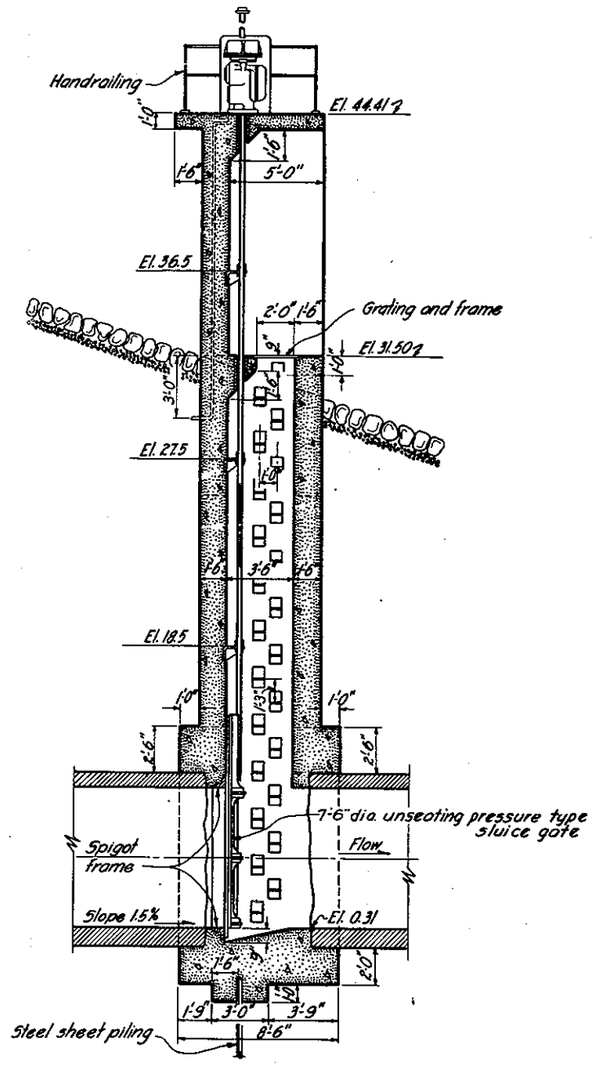
PLATE XLIX



KEENEY LAKE CONDUIT
GATE STRUCTURE



KEENEY LANE PUMPING STATION



POTTER ST. CONDUIT
GATE STRUCTURE

NOTES

*Indicates equipment Meadows Pumping Station.

Elevations shown refer to Mean Sea Level Datum.

CONNECTICUT RIVER FLOOD CONTROL

KEENEY LANE PUMPING STATION

HARTFORD, CONN.

CONNECTICUT RIVER — CONNECTICUT

SCALE 1/4 IN. = 1 FT.

5' 0 5 10'

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